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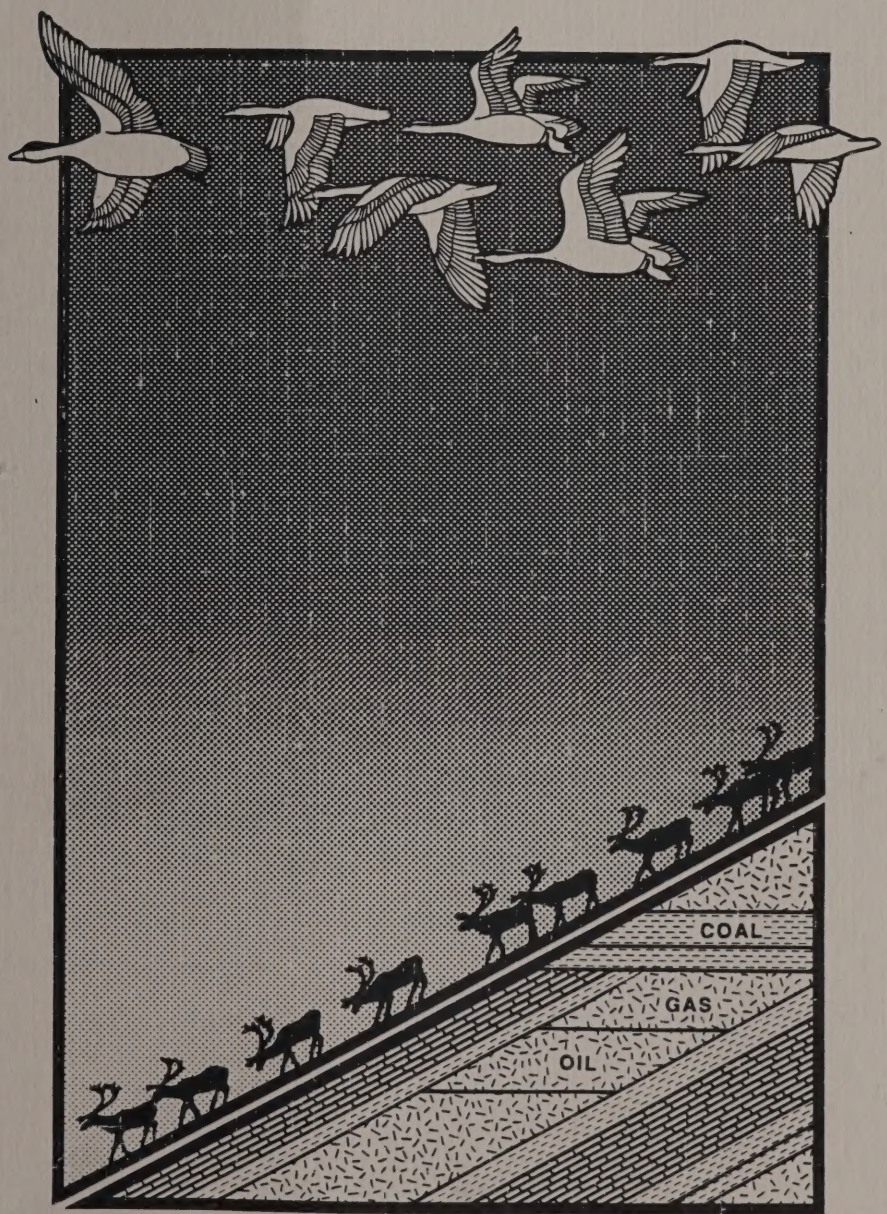
The National Petroleum Reserve-Alaska

A Reader



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THE NATIONAL PETROLEUM RESERVE-ALASKA

A READER

October 10, 1990

prepared by:

Bureau of Land Management
Alaska State Office
and
Arctic District Office

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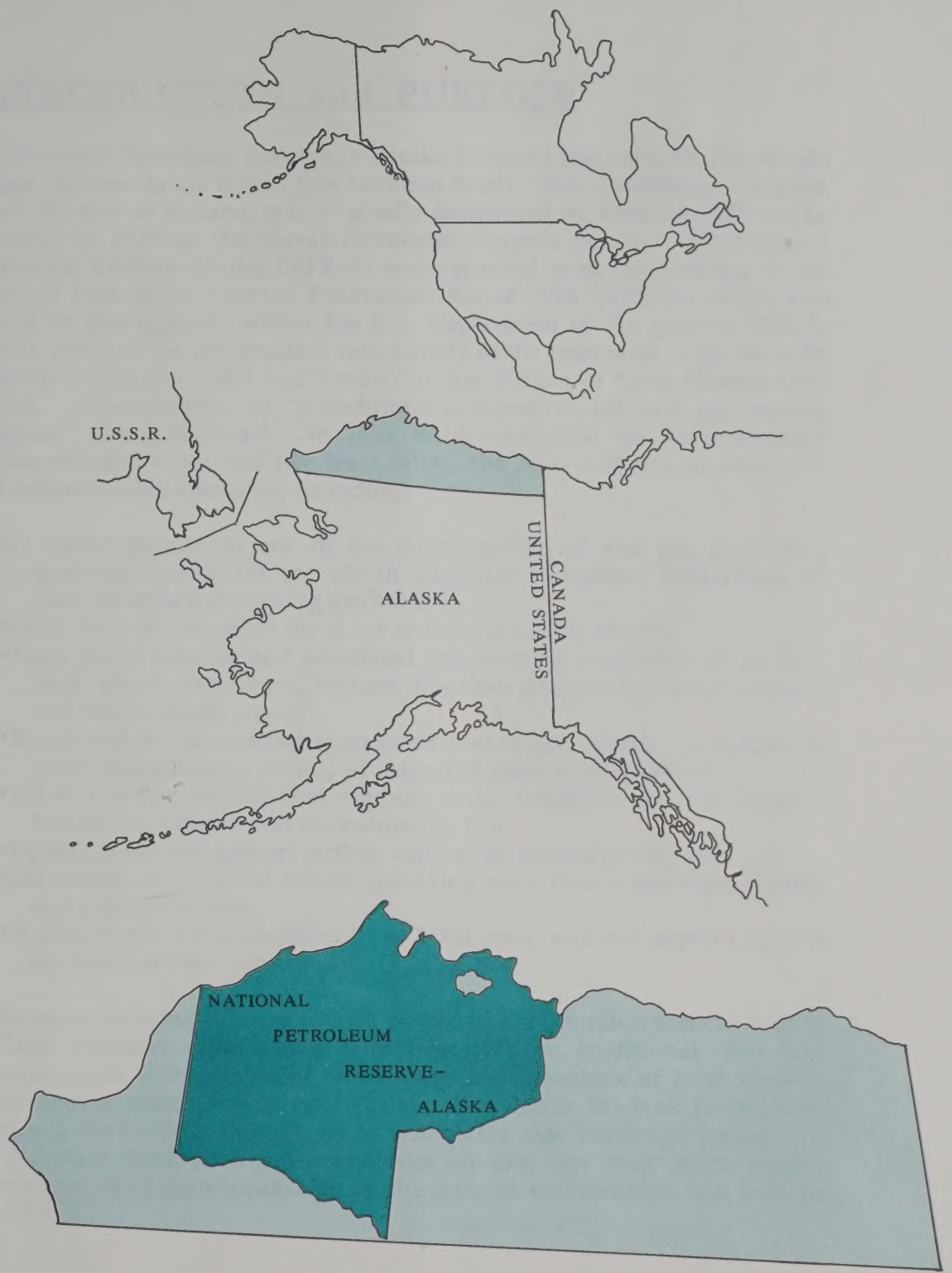


Location of National Petroleum Reserve in Alaska

INTRODUCTION and PURPOSE

The National Petroleum Reserve in Alaska (NPR-A) lies between the Brooks Range and the Arctic Ocean (see Location Map). This 23-million acre tract, about the size of Indiana, was originally designated by President Warren G. Harding in 1923 as the Naval Petroleum Reserve No. 4. The National Petroleum Reserve-Alaska (NPR-A) was renamed with the passage of the National Petroleum Reserves Production Act of 1976 (NPRPA) which also placed its management within the U.S. Department of the Interior (USDI). Section 105(c) of the Act required that a study of the reserve be undertaken by a group within the USDI and headed by the Bureau of Land Management (BLM). Subsequently, an "expeditious competitive oil and gas leasing program" was authorized. In 1981 BLM completed an Environmental Assessment and conducted two lease sales. The NPR-A is rich in renewable and nonrenewable resources, including:

- A major portion of one of the most prolific oil and gas producing geologic system on the North American continent containing oil discoveries and producing gas fields.
- More than 40 percent of the U.S.'s remaining supply of coal.
- High grade metallic and associated non-metallic minerals such as zinc, lead, silver, chromium, barium, flourine, phosphate, nickel, copper, and the platinum group.
- Significant Arctic wetland ecosystems that support black brant, Canada geese, pintail ducks, swans, whitefronted geese and shorebirds.
- Other riverine habitat that support arctic peregrine falcons, muskox habitat, fur-bearers and overwintering fish.
- Upland areas that support caribou and barren ground grizzly bear.
- Recreation and cultural values, including more than a thousand historic and prehistoric sites.
- A people who have inhabited it for 8,000 years, and still depend upon it for much of their subsistence.

These resources offer different users a variety of opportunities and can lead to conflicts between development and preservation, traditional uses and national needs, recreation and subsistence and questions of local control, transportation routes and cultural change. This *Reader* has been prepared to provide a summary of the natural as well as the man made environment of the National Petroleum Reserve-Alaska so that one may more clearly understand the interrelationships of the natural environment and man in the NPR-A.

NATURAL ENVIRONMENT

Climate and Air Resources

Arctic weather sharply contrasts with weather in other parts of Alaska. Average temperatures are cold, and persistently strong winds blow over the northern half of the area. Although the terrain is continuously wet in the summer and dotted with lakes, the amount of precipitation is low. Despite the proximity of the offshore icepack to land for at least 10 months of the year, the Arctic Ocean has a modifying effect on coastal temperature and precipitation. Despite the proximity of the offshore icepack to land for at least 10 months of the year, the Arctic Ocean has a modifying effect on coastal temperature and precipitation. Therefore, except at higher elevations, the region may be classified as a desert-- a desert of frozen land.

Weather along the coast is reasonably represented by the conditions at Barrow where temperatures range from 29 to 44 degrees F. in the summer, -6 to -25 degrees F. in the winter, with extremes of -56 to -78 F. degrees. Precipitation averages 5 inches which includes 29 inches of snow. Average winds are from the ENE at about 15 mph. Fog occurs during the year, with occasional ice fog near communities.

Inland from the coast, weather varies more locally. Umiat, in the Brooks Range has lighter and more variable winds, temperatures have greater extremes than along the coast, but precipitation is about the same.

Precipitation throughout the region depends considerably on location. Heaviest amounts occur in the Brooks Range-this could be upward of 30 inches falling off to 10 inches in places. In the coastal and foothills areas amounts range from 7 inches to less than 5 inches. Snowfall amounts correspond to areas with heaviest precipitation. Table 1 identifies some of the total inches of snowfall:

TABLE 1
TOTAL SNOWFALL IN INCHES

Location	Snowfall in annual total inches
Barrow	29
Wainwright	12
Umiat	33

The freezing and thawing of tundra, watery marshes, and lakes affect all of the Arctic. The rates of increase and decrease in ice thickness is a result, not only of temperature but snow cover as well.

Air quality is considered excellent throughout the area. Exceptions occur near villages or temporary sites of human activity where occasional smoke and dust may reduce air quality. The greatest effect of smoke is restriction of visibility. It is rarely thick enough to cause discomfort for individuals with respiratory problems. Smoke from forest fires in Siberia and air pollution from northern Europe infrequently drift over the Arctic Ocean and degrade air quality somewhat, but by the time these pollutants reach northern Alaska their concentrations are diluted and are of minimal concern.

Pronounced temperature inversions tend to restrict vertical air circulation and mixing and persistent light surface winds and the occurrence of up and down drafts in the mountainous regions combine to prevent the development of air masses containing pollutants.

Visibility is impaired along the coast of the NPR-A by steam fog, and by sea smoke and ice fog. Visibility is also impaired by whiteouts and blowing snow associated with winds.

Physiographic Provinces

The Arctic region and specifically the NPR-A are commonly divided into three physiographic provinces: the Brooks Range, the Arctic Foothills, and the Arctic Coastal Plain (see Physiographic Provinces Map).

The Brooks Range is a rugged, glaciated barrier that extends from the Canadian border across northern Alaska to the Chukchi Sea. The Range is virtually treeless and widely underlain by permanently frozen ground. There is sufficient sunlight and enough moisture to change the tundra into a summer carpet of miniature, flowering plants. From this high country flow the numerous rivers such as the Colville and Utukok. The river valleys are characterized by high brush. The arctic mountains section includes peaks that are mainly the result of carving of folded and faulted sedimentary rocks. In the De Long Mountains the major peaks are rugged, glaciated ridges 4,000 to 4,900 feet high. The boundary with the foothills in the north are irregular and indistinct. More easterly, the Brooks Range consists of rugged, glaciated, east-trending ridges with summits rising above 7,000 feet. Cliff and bench topography, typical of glaciated eroded sedimentary rock is characteristic of this area.

To the north of the Brooks Range province is the Arctic Foothills--rolling uplands of moist tundra punctuated by great ridges. The southern foothills

which vary in height from 1,200 to 2,500 feet, are characterized by irregular buttes, knobs, mesas, east-trending ridges and intervening, rolling tundra plains. The northern foothills falls from 1,200 feet to 600 feet and consist of broad east-trending ridges with local mesa-like mountains. The northern foothills drain to the Arctic Coastal Plain; the southern portion drains to the Colville River.

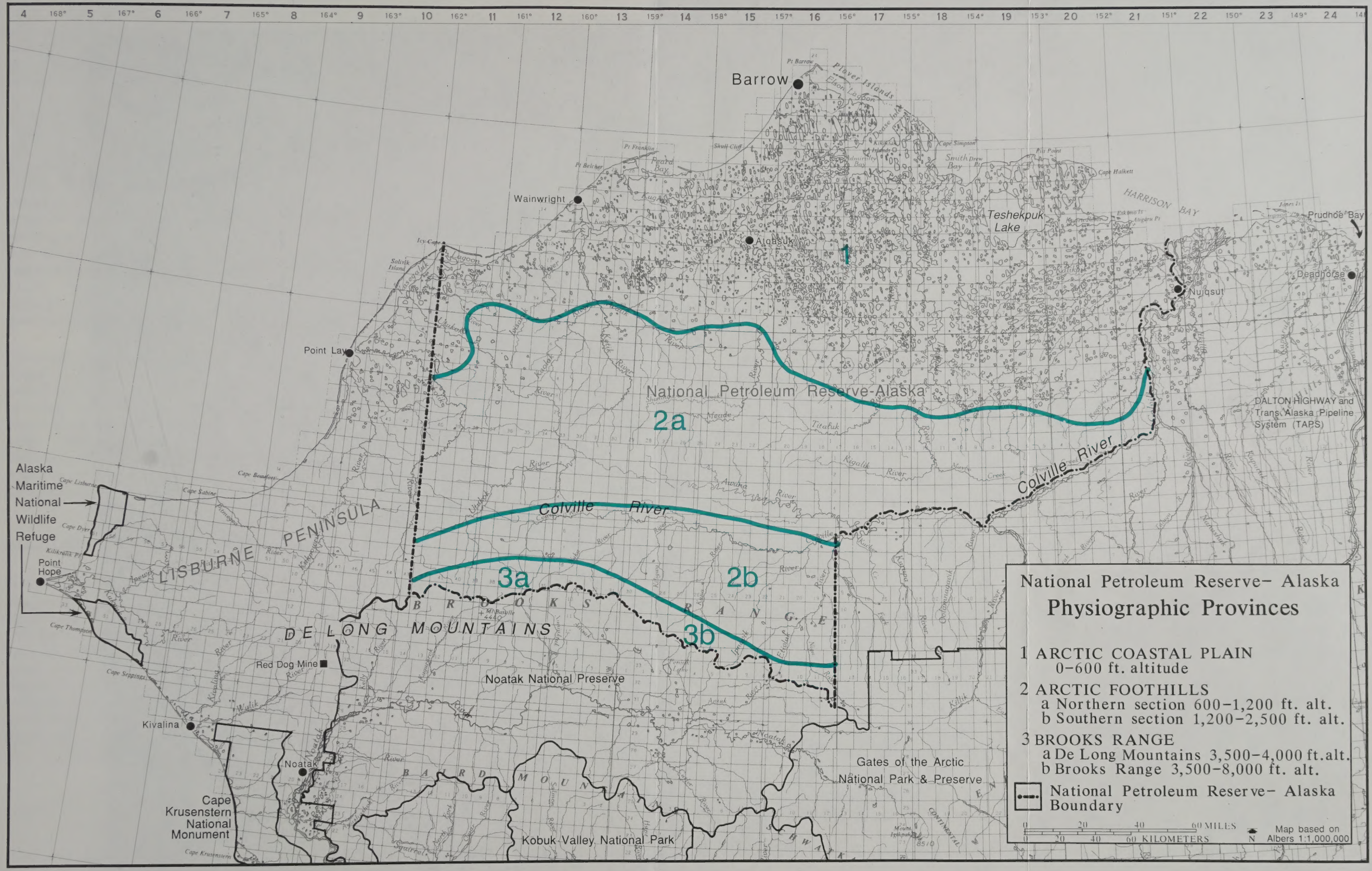
The Arctic Coastal Plain is a smooth nearly featureless plain rising gently from the shore to a height of 600 feet. It is a poorly drained region with about 30 percent of the surface being water. It is characterized by thousands of shallow, impermanent lakes, thaw lakes and drained lake basins, where successive freezing and thawing of moisture laden soils causes frequent draining and reforming of these lakes. The area also contains meandering streams, drained and undrained lagoons, sand dunes, and ice wedge polygons. The coastal plain west of the Colville River to the Kuk River is essentially flat except for occasional pingos and a section of sand dunes.

Due to the extensive flat terrain and continuous occurrences of impermeable permafrost, drainage on the coastal plain is very poor, and marshes occur in most low areas. Rivers that cross the plain originate in the hills and mountains to the south.

The Arctic coast is generally low and flat except for occasional sections of bluffs and sea cliffs. Deltas terminate the larger rivers and streams. Barrier islands and spits run in a broken line a few miles offshore, enclosing long, narrow lagoons. Point Barrow is the divide between the Chukchi and Beaufort Sea coastlines. The Chukchi Sea coast is fronted at most places by narrow gravel beaches below low, coastal banks and bluffs. Many river mouths are drowned estuaries, evidence of recent coastal subsidence or higher sea levels. Gravel spits extend across the mouths of most estuaries and bays. The Chukchi and Beaufort seas are ice covered for up to nine months a year. Offshore, the Arctic Coastal Plain continues with little break onto the continental shelf, a distance from 30 to several hundred miles.

Permafrost and Soils

Permafrost is permanently frozen ground. Local variations in thickness, areal extent, and permafrost temperature depend on differing thermal properties of the earths materials, and on local differences in climate, topography, vegetation, geology, hydrology, and the rate of heat flow. The entire area is underlain by continuous permafrost extending from a few inches below the land surface to depths ranging from 600 to 1,200 feet. Permafrost retards drainage. This result in wet, shallow, poorly defined soils with relatively high organic content which is minimally decomposed. These soils are highly susceptible to erosion or any soil movement caused by disturbance of



National Petroleum Reserve– Alaska

Physiographic Provinces

1 ARCTIC COASTAL PLAIN
0–600 ft. altitude

2 ARCTIC FOOTHILLS
a Northern section 600–1,200 ft. alt.
b Southern section 1,200–2,500 ft. alt.

3 BROOKS RANGE
a De Long Mountains 3,500–4,000 ft.alt.
b Brooks Range 3,500–8,000 ft. alt.

National Petroleum Reserve– Alaska Boundary

0 20 40 60 MILES
0 20 40 60 KILOMETERS

protective vegetation and subsequent thawing of underlaying permafrost. Generally, soils have developed on fine textured materials, such as silt loams and silty clay loams, found on low rolling hills, at the foot of slopes, valley bottoms, and on the coastal plain.

The Brooks Range consists mainly of very steep, exposed bedrock and coarse rubble. Gravelly glacial till is found in valleys with outwash deposits down to the foothills. Vegetation cover is sparse. The Arctic Foothills has a rolling topography with broad drainages in the uplands that level out to the coastal plains. Soils form in a variety of parent materials, ranging from very gravelly deposits on ridges to fine grained materials in lower areas. The dominant soils are poorly drained and form in long, broad valleys. A few peat soils occur and permafrost is generally shallow. The Arctic Coastal Plain include low terraces and floodplains with materials underlying it consisting of water-deposited sand and silts from streams. Soils are generally poorly drained with loamy textures common to terraces and organic soils occurring in depressions. There are large windblown sand deposits and low dunes in portions of this area.

Generally, any activity that disturbs the protective vegetation cover results in eventual erosion damage to the underlying soils. This disturbed vegetation results in absorption of radiant heat thawing underlying permafrost in the summer which refreezes in the winter. This phenomenon, know as thermokarsting drives ice wedges deeper and deeper, enlarging the disturbed area. Thermokarst topography consists of mounds, sink holes, tunnels, caverns, short ravines, lake basins and circular lowlands and has resulted in a complex mosaic of polygons, ice-cored mounds (pingos), terraces, and remnant oxbows lakes.

Geology

The major structural elements that are represented in NPR-A are: the Brooks Range, a folded, uplifted mass of rock units; the Colville trough or geosyncline, a basin containing thick deposits of sedimentary rocks derived from the Brooks Range; and the Barrow Arch, a broad regional subsurface high that extends along the Arctic Coast. These features correspond in a geographic sense to the Brooks Range, the Arctic Foothills, and the Arctic Coastal Plain physiographic provinces, respectively. In addition to complex bedrock structures in these provinces, the surface is marked with unconsolidated deposits of clay, silt, sand and gravel, glacial deposits, sand dunes, alluvial and coastal deposits.

Mineral Resources

The mineral resources of the NPR-A and adjacent area may be described in terms of two regional geologic settings, a southern region of relatively older rocks from the mid-Paleozoic through mid-Cretaceous period or about 360 to 100 million years old, and a northern region of younger rocks from the Cretaceous and younger periods or about 100 million years old to the present. Each of these settings possesses geologic characteristics which may be related to known mineral occurrences. These characteristics may be used to infer the existence of potential, but as yet undiscovered, mineral resources as well.

The potential for a significant economic discovery of hydrocarbon within NPR-A is high based upon our understanding of the geologic history of the NPR-A and the known presence of hydrocarbon occurrences. The area contains adequate source rock for generation of hydrocarbon, reservoir and cap rock for the accumulation of hydrocarbons, and favorable structures for trapping hydrocarbons.

The tightly folded and thrust-faulted terrane of the Brooks Range and the Foothill section have known mineral ocurrences of phosphate, coal, lead-zinc and silver, barite, chromite and the platinum group elements. Other mineral resources include bentonite, clay, sand and gravel, and possibly uranium. We may surmise, however, from the known geology that significant mineral resources are present.

Oil and Gas

This area was originally established in 1923 because its geology was favorable to petroleum, and travelers had found oil seeps at Simpson Lagoon, Skull Cliffs, Fish Creek, Umiat, the mountain front, and oil-stained sandstones in the southern foothills region. Since then, a sub-giant field or possibly a giant field (estimated to be 70 to 120 million barrels) has been found at Umiat, and other fields have been located in Cape Simpson and the Fish Creek areas. The known gas fields include east and south Barrow(which also have unproduced oil), Walakpa, Square Lake, Meade, and Wolf Creek (see Oil and Gas Map.)

Drilling in the NPRA began in the early 1940s with many shallow tests at Barrow and Umiat. Core holes (depths from 100 feet to 3,000 feet) were dug at Barrow, Oomalik, Simpson, and Umiat. From the mid-70s to 1981, only some 28 wells (average depth less than 8,000 feet) were drilled with modern methods. These modern wells were drilled for geological assessment purposes rather than discovery, but most had oil or gas shows. The drilling data and rock outcrop data indicate at least four potential oil generating units in NPR-A. Seismic interpretation shows the presence of many geological

Are there
still areas
under lease ?

Barrow
Wainwright
Atqasuk
Point Lay
Teshekpuk Lake
Prudhoe Bay
Deadhorse
Nuiqsut
National Petroleum Reserve-Alaska
DALTON HIGHWAY and Trans Alaska Pipeline System (TAPS)
Colville River
Alaska Maritime National Wildlife Refuge
Point Hope
LISBURNE PENINSULA
BROOKS RANGE
DE LONG MOUNTAINS
Red Dog Mine
Noatak National Preserve
Kivalina
Noatak
Cape Krusenstern National Monument
BAIRD MOUNTAINS
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve
HARRISON BAY

National Petroleum Reserve– Alaska
Oil and Gas

- Oilfield
- Gasfield
- Areas Held Under Oil & Gas Lease
- National Petroleum Reserve–Alaska Boundary

0 20 40 60 MILES
0 20 40 60 KILOMETERS
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Map based on Albers 1:1,000,000

structures capable of containing oil. In addition, the complicated geology of southern NPR-A is similar to recently explored and now productive regions of the Rocky Mountain region. This area of southern NPR-A, especially the Utukok uplands, is also the least explored. Fields have been discovered in the similar geological setting of the Rocky Mountains in the Lower 48 with resources in the 100-600 million barrel range. The U.S. Geological Survey "in-place" oil resources of NPR-A were estimated, in 1985, to be between 820 million barrels to 15.4 billion barrels, with a mean of 5.97 billion barrels. The "in-place" gas estimates are between 2.4 trillion cubic feet to 27.2 trillion cubic feet with a mean of 11.3 trillion cubic feet.

Although no areas outside of the Barrow Gas Field (local market) are currently producing, all the geological conditions necessary for petroleum generation are present, indicating that large quantities of oil and gas may have been generated. In 1985, after the last NPR-A lease sale, Texaco made a discovery in the Colville Delta just outside of NPR-A. A large-scale, modern exploration effort is still required to adequately define the potential of this part of the North Slope Petroleum Province. The entire NPR-A area has high potential for oil and gas, as predicted by the BLM system of classification.

Locatable /Solid Non-Energy Leasable Minerals

The southern region of the Arctic Foothills contains, or is adjacent to, known occurrences of phosphate rock, metalliferous oil shale, zinc, lead, silver, barite, chromite, platinum group elements, copper, and fluorite. Additional occurrences, as well as other mineral commodities which are commonly associated with the geologic environments known to be present in the region, can be expected to be found. The northern region of the Arctic Foothills contains not only significant known coal deposits, but also considerably greater amounts of coal whose extent, thickness, and character remain to be determined. Additionally, the geologic setting in this region has the potential for the presence of a variety of mineral resources including uranium, base and precious metals, and nonmetallic materials (see Locatable/Solid Non-Energy Leasable Minerals Map.)

The southern portions of the area are underlain by Mesozoic-Paleozoic age sedimentary rocks, with associated intrusive and extrusive igneous (volcanic) rocks. These are, in part, similar to the rocks that host the world-class Red Dog mine containing economic base metals such as zinc, lead, and silver. Ore reserves of approximate 85 million tons, with grades of 17.1 percent zinc, 5.0 percent lead, and 2.5 oz of silver per ton. This is the second largest deposit of zinc ever found. This mine is forty miles from the southwest corner of the NPR-A. Geologic terranes similar to the Red Dog environs persist to the north and east of that mine into NPR-A.

There are a number of analogous occurrences of mineralization in the southern part of the NPR-A (e.g., Drenchwater Creek, Kivliktort Mountain, Story Creek), as well as other showings and geochemical anomalies related to similar mineralization. Some associated rocks are phosphatic, frequently with elevated concentrations of uranium. A horizon of "bituminous rock/oil shale" also occurs within this rock sequence, characterized by elevated concentrations of precious and base metals. Occurrences of platinum, palladium, copper, and chromite are known to be present in places across the southern portion of the adjacent region with similar anomalous values also found in NPR-A.

Mineral Materials

Lands adjacent to the active streams within the valleys and upland sites are suitable for gravel and sand extraction (mineral material). The amount of gravel estimated to be available within NPR-A is moderate in comparison to other areas within the state. Much of the gravel of NPR-A occurs as barrier islands and accumulated beach deposits. Gravel is also found along exposed gravel bars along the major streams (see Mineral Materials Map.)

Coal

Bituminous-subbituminous coal resources are of appreciable extent and enormous quantity. Considering only beds with overburden thicknesses of less than 500 feet, these resources are on the order of at least 2.7 trillion tons, in beds as much as 20 feet thick. In addition, the northern region of NPR-A contains considerably greater amounts of coal whose extent, thickness, and character remain to be determined. The region may contain on the order of at least 40 percent of the total coal resource potential of the United States.

The major coal-bearing units in NPR-A occur in two sedimentary rock sequences. One sequence is of high quality and may underlie 30,000 square miles of northern Alaska, where coal resource estimates range from 400 billion to 4 trillion tons. Coals in the other sequence are thinner, less abundant, and of inferior quality (see Coal Map).

The coal rank ranges between high volatile bituminous and sub-bituminous. The bituminous coals (moisture free) have low sulfur (0.1-0.5 percent) and ash 4-15 percent) content, with heating value of approximately 10,000-14,500 Btu/lb. Some of the coals in the foothills region are of coking quality. The sub-bituminous coals (moisture free) have 0.2-0.8 percent sulfur and 3-20 percent ash, with heating value of between 7,000 and 10,780 Btu/lb.

Barrow
Wainwright
Atqasuk
Point Lay
Teshekpuk Lake
Nuiqsut
Deadhorse
Prudhoe Bay
HARRISON BAY
National Petroleum Reserve-Alaska
DALTON HIGHWAY and Trans-Alaska Pipeline System (TAPS)
Colville River
Alaska Maritime National Wildlife Refuge
Point Hope
LISBURNE PENINSULA
DE LONG MOUNTAINS
BROOKS RANGE
DRENCHWATER
STORY CREEK
KIVALIK TORT MOUNTAIN
Red Dog Mine
Noatak National Preserve
Kivalina
Noatak
BARD MOUNTAIN
Cape Krusenstern National Monument
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve

National Petroleum Reserve– Alaska

Locatable/Solid Non–energy Leasable Minerals

- Mineral Occurrences and/or High Geochemical Values
- Major Base Metal Mineralization
- National Petroleum Reserve– Alaska Boundary

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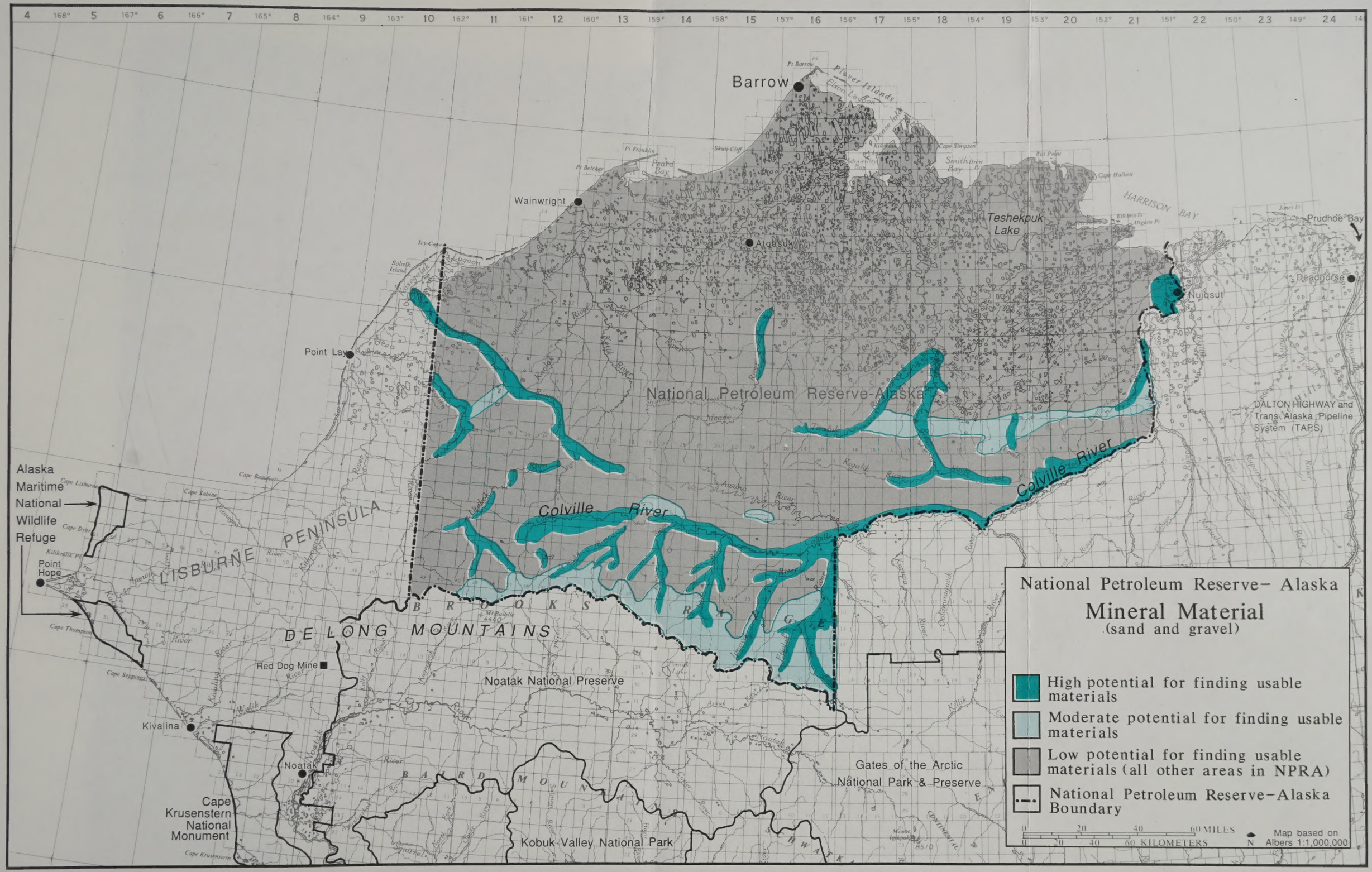
Map based on Albers 1:1,000,000


Barrow
Wainwright
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Red Dog Mine
Noatak National Preserve
Kivalina
Noatak
Cape Krusenstern National Monument
BAIRD MOUNTAINS
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve
HARRISON BAY
National Petroleum Reserve– Alaska
Mineral Material
(sand and gravel)
High potential for finding usable materials
Moderate potential for finding usable materials
Low potential for finding usable materials (all other areas in NPRA)
National Petroleum Reserve–Alaska Boundary
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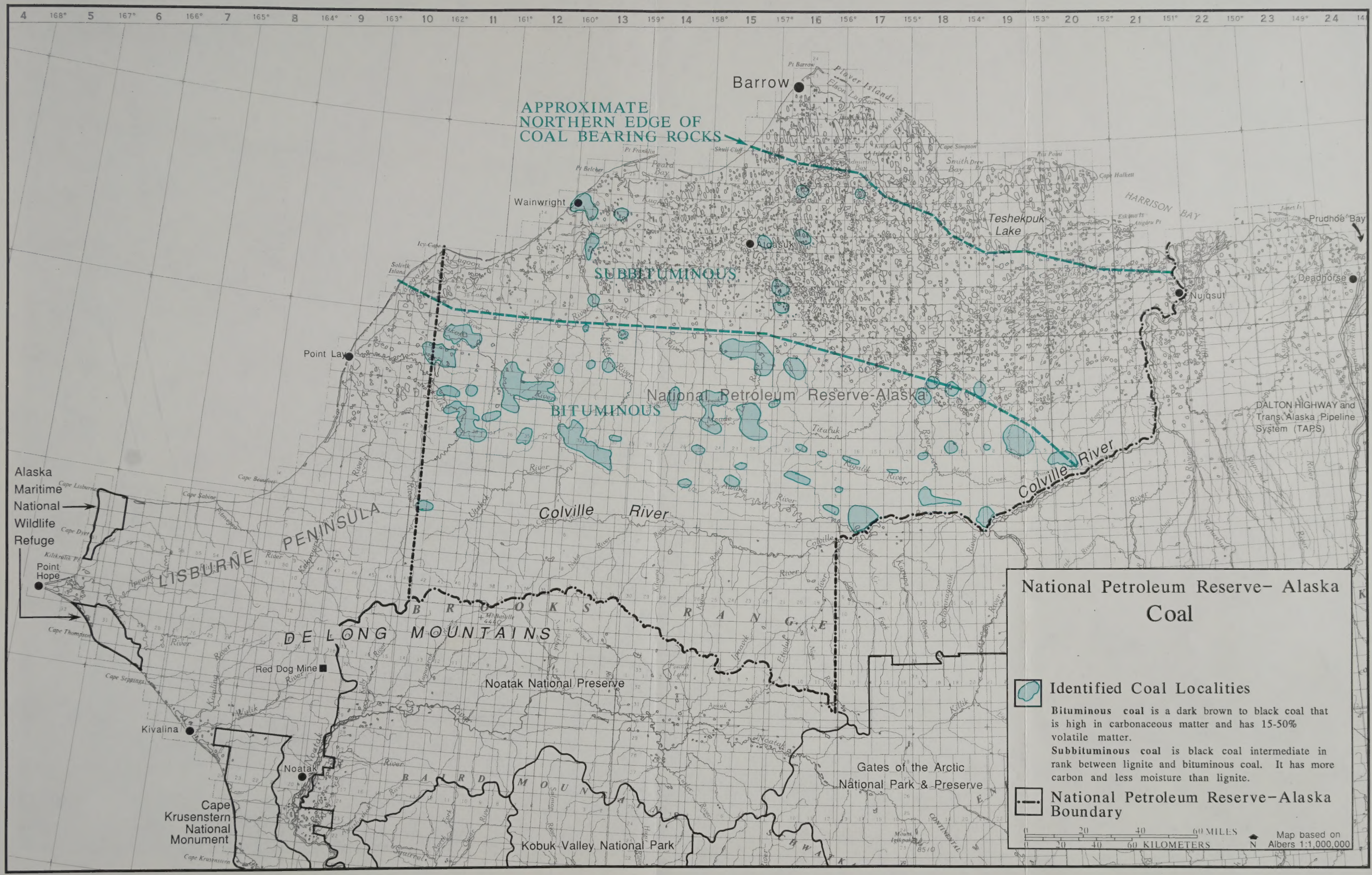
Map based on Albers 1:1,000,000


Barrow
APPROXIMATE
NORTHERN EDGE OF
COAL BEARING ROCKS
Wainwright
Teshekpuk
Lake
Prudhoe Bay
Deadhorse
Nuiqsut
SUBBITUMINOUS
BITUMINOUS
Point Lay
National Petroleum Reserve-Alaska
DALTON HIGHWAY and
Trans Alaska Pipeline
System (TAPS)
Colville River
Alaska
Maritime
National
Wildlife
Refuge
Point
Hope
LISBURNE PENINSULA
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Noatak National Preserve
Kivalina
Noatak
Cape
Krusenstern
National
Monument
BAIRD MOUNTAINS
Kobuk Valley National Park
Gates of the Arctic
National Park & Preserve
HARRISON BAY
National Petroleum Reserve– Alaska
Coal
Identified Coal Localities
Bituminous coal is a dark brown to black coal that is high in carbonaceous matter and has 15-50% volatile matter.
Subbituminous coal is black coal intermediate in rank between lignite and bituminous coal. It has more carbon and less moisture than lignite.
National Petroleum Reserve–Alaska Boundary
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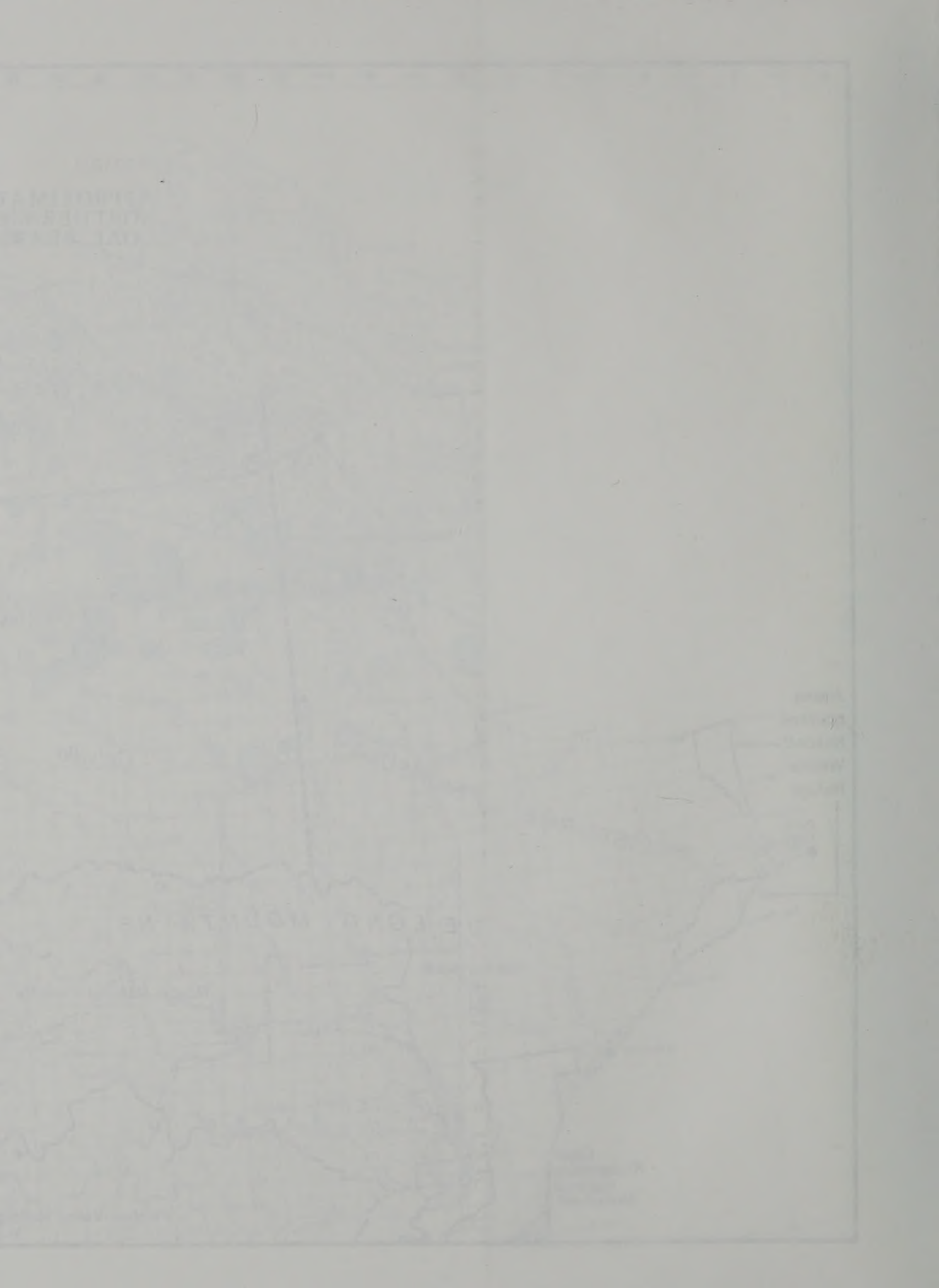
Map based on
Albers 1:1,000,000



Water Resources

Eight major rivers, the primary one being the Colville which is the largest river on the North Slope, drain 95 percent of the NPR-A. The area also has thousands of freshwater lakes. Thaw lakes cover more than 50 percent of the Arctic Coastal Plain. Teshekpuk Lake, the largest, is over 25 miles long. Glacial lakes are widely scattered among the mountains and foothills. Lakes less than 6-8 feet deep usually freeze to the bottom in the winter.

Watershed conditions are generally excellent because of the undisturbed environment and relatively flat topography over the vast expanse of the area. Accelerated erosion is not a problem except for limited areas of human disturbance of the vegetative cover and altered stream channel morphology. However, natural erosion is common with the highly erodible soils. High stream flows are usually accompanied by heavy siltation of the larger rivers. Due to the limited vegetation along streambanks there is no protection from scouring ice flows at breakup each summer. As a result, stream channels move back and forth across floodplains as sediments are eroded from cut banks and deposited in back water areas.

Surface water quantity and quality varies with the season. During the summer, water is abundant, particularly across the flats of the Arctic Coastal Plain with its thousands of lakes. Generally, rivers reach their maximum streamflow during breakup in mid-June. Flow rates vary with the snow melt and the intensity of summer rains. During breakup, with the abundance of free water and the presence of permafrost, infiltration is minimal while runoff is increased significantly. During the winter, precipitation and runoff are largely frozen reducing or eliminating stream flow. Seasonal snow pack provides the most important storage of water in the hydrologic cycle. Frozen winter river overflows (aufeis) also results in considerable water storage. Ground water resources in NPR-A are virtually nonexistent because of widespread thick permafrost.

Biotic Communities

Threatened, endangered, and candidate species that are in or may be found in the NPR-A include:

peregrine falcon which is classified as a threatened species and is found throughout the NPR-A, primarily along the Colville River and its tributaries. The breeding population in the 1950s was estimated between 60 and 150 pairs along the Colville and its tributaries. In 1989, 53 pairs of peregrine falcons were observed along the Colville and its tributaries. The peregrine falcon population along the Colville River is continuing a steady increase from its low in the mid-1970s.

Eskimo curlew (Humenius borealis) is listed as an endangered species, although it is thought to be extinct because it has not been sighted in Alaska since the late 1800s. Because it appears very similar to other species of curlew who use the NPR-A, there is a remote chance it may still exist in the region.

Drummond bluebell (Mertensia drummondii) was located during the only survey for candidate plant species accomplished within the NPR-A.

Vegetation

NPR-A can be divided into several vegetative zones having relatively distinct relationships and associated successional patterns (see Vegetation Map). The flora within the NPR-A is typical of the North Slope and includes these six major plant communities:

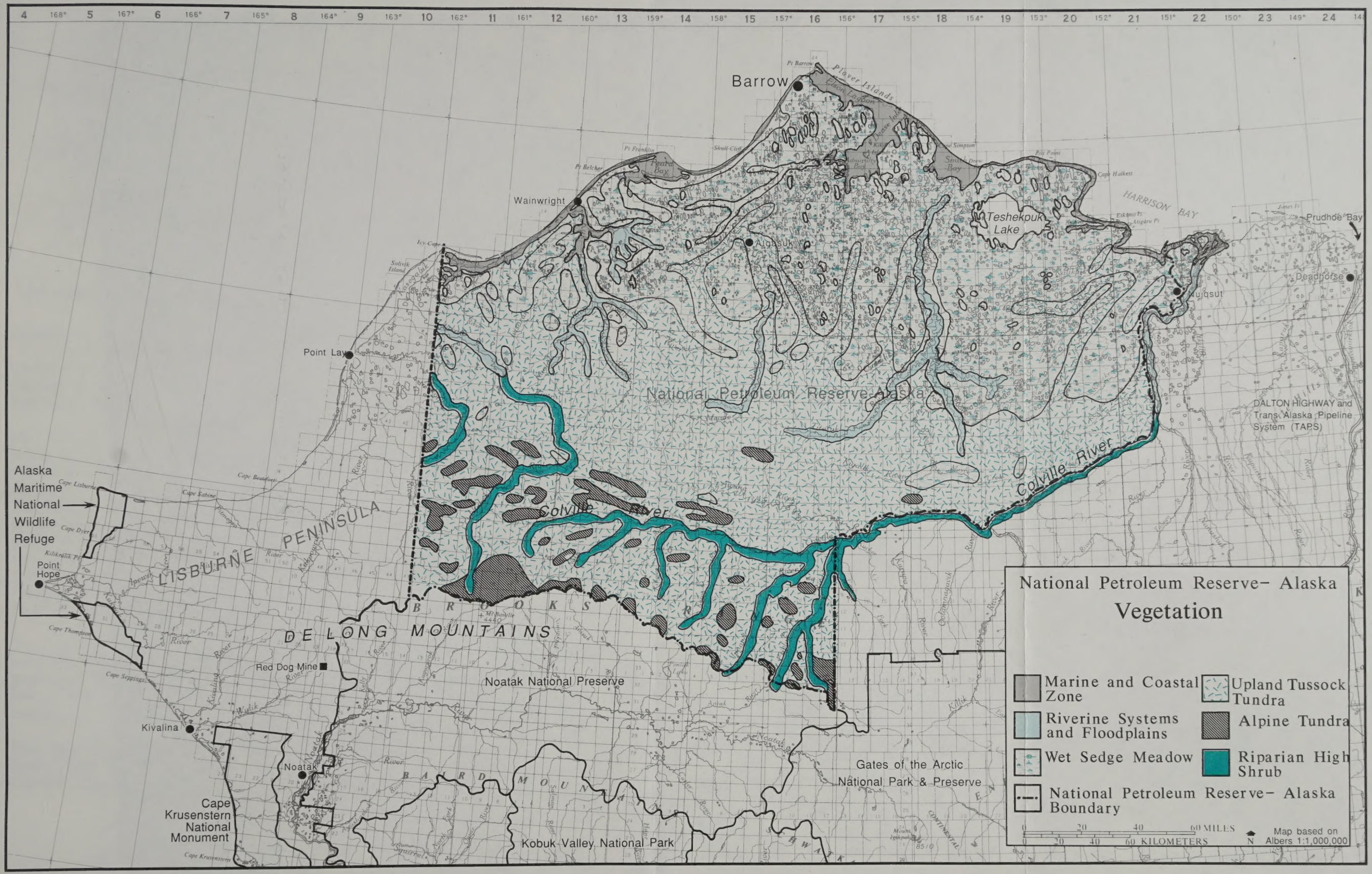
Wet sedge meadows: This community dominates the Arctic Coastal Plain. Peaty soils have a shallow active layer that is saturated throughout the summer. Sedges make up about 75 percent of the vegetation. Mosses are common while lichens are few. Secondary species include cotton grass, lousewort, and buttercup in the wetter sites and heather and purple mountain saxifrage in drier habitat.

Submerged and emergent aquatic vegetation inhabiting the shallow lakes of the coastal plan usually separated from terrestrial plant communities, but in the case of the Arctic Coastal Plain, dominant species (sedges and grasses) of rooted aquatics are the same genus, if not the same species, as those listed for wet sedge meadows.

Riverine systems and floodplains: The flood plains of the major rivers are distinct systems that dissect and interact with adjoining systems. Due to the poor drainage, damming effects of snow drifts, and low evaporation rates, large parts of the wet sedge meadows are flooded during early summer. Oxbow lakes and associated emergent vegetation and wet sedge meadows are interspersed with higher terraces, especially in the foothills. These flooded areas are important to the production of diverse invertebrate populations and provide significant early summer wetlands, as well as an edge effect.

Riparian high shrub: This distinctive riparian vegetative community in the foothills and mountain zone makes up the riparian vegetation along the upper floodplains of the Colville, Utukok and Ikpikpuk rivers. Soils are usually well drained sediments. The community is constantly changing due to ice and flood damage which usually occurs annually. Dominant climax species include willows, many mosses, and lichens and alders .

Upland tussock tundra: This community dominates the foothill region. Cottongrass tussocks 6 to 10 inches high, separated by narrow channels, covers large areas of rolling terrain. Mosses and lichens are common as well as shrubs such as dwarf birch and willows. This is the most


Barrow
Wainwright
Point Lay
Atqasuk
Teshekpuk Lake
Prudhoe Bay
Deadhorse
Nuiqsut
National Petroleum Reserve-Alaska
DALTON HIGHWAY and Trans-Alaska Pipeline System (TAPS)
Colville River
Alaska Maritime National Wildlife Refuge
Point Hope
LISBURNE PENINSULA
DE LONG MOUNTAINS
BROOKS RANGE
Red Dog Mine
Noatak National Preserve
Kivalina
Noatak
Cape Krusenstern National Monument
BAIRD MOUNTAINS
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve
HARRISON BAY
National Petroleum Reserve- Alaska
Vegetation
Marine and Coastal Zone
Upland Tussock Tundra
Riverine Systems and Floodplains
Alpine Tundra
Wet Sedge Meadow
Riparian High Shrub
National Petroleum Reserve- Alaska Boundary
0 20 40 60 MILES
0 20 40 60 KILOMETERS
N
Map based on Albers 1:1,000,000

abundant vegetation type in the NPR-A, covering a significant portion of the coastal plain, especially the southern part, most of the foothills zone and parts of the mountain zone up to altitudes of about 3,000 feet.

Alpine tundra: This community occurs in mountainous areas and along well-drained, rocky ridges. Soils are rocky and dry. Dominant species include mountain avens, willows, and heather. Mosses and lichens, especially reindeer moss are common.

Marine and Coastal Zone: The marine environment within and adjacent to the NPR-A includes five types of habitat which are: shallow coastal marshes, especially along the Beaufort Sea; estuaries where fresh water enters the sea; brackish lagoons, protected bays and inlets; shallow near shore areas, often subject to ice scouring; and the offshore Beaufort and Chukchi seas.

Terrestrial and Aquatic Resources

Wildlife

Caribou in NPR-A are in one of two distinct herds: the Western Arctic or the Teshekpuk Lake. Not until the mid-1970s did scientists identify the Teshepuk Lake herd as distinct from the larger Western Arctic herd (see Wildlife I Map).

The Western Arctic herd migrates in and out of NPR-A during the year, while the Teshekpuk Lake herd remains in year-long residence. Although the herds occasionally overlap during their summer and winter movements, each has its own calving area and thus are considered separate herds.
The Western Arctic Caribou herd inhabits the western and southern portions of the reserve. Small groups of animals do remain year-long during some years, but the majority spend only the spring and summer months within the area, migrating south of the Brooks Range during the fall and winter months. The herd traditionally calves near the headwaters of the Utukok, Ketik, Meade and Colville rivers, with seasonal movements as far east as the Sagavanirktok River.

The Western Arctic Caribou herd, Alaska's largest, has gone through several naturally caused population fluctuations in the last two decades. In 1970, the population was estimated at 242,000, but by 1975 had declined to an all-time low of 75,000. Today, the population has rebounded to an estimated 300,000+ animals.

The Teshekpuk Lake Caribou herd spends most of the year within the Teshekpuk Lake area, making short seasonal movements between the Colville River and Admiralty Bay. The Teshekpuk Lake Caribou herd had

3,000-4,000 animals in the mid 1970s. Today it is one of the fastest growing herds in Alaska, with an estimated population of 15,000+ animals...

Moose are found in low numbers throughout most of the southern portion of the NPR-A during the summer months. During the winter they are generally restricted to the major river drainages, where sufficient quantities of browse species are available. In winter the largest concentrations of moose occurs along the Colville River. This river supports riparian habitat that is crucial foraging areas for moose during the winter months.

There are no current estimates of the moose population within NPR-A, however, there are some estimates of the moose populations of the Colville Basin. The estimated moose population within the Colville River drainage is 1,500 to 1,700 animals. However, the majority of the optimum moose habitat in the drainage is located outside of NPR-A. Taking into account the limited moose habitat within NPR-A, it is estimated that only about 100-200 moose are found in it, mainly within the Colville River drainage.

Muskoxen were reintroduced to the Alaskan Arctic Slope in 1969 when 52 animals were released at Barter Island. In 1970, 13 more animals were released on the Kavik River and 36 at Cape Thompson. The muskox have established themselves on the North Slope east of the Kavik and Canning rivers, along the Arctic Coastal Plain. In recent years, small groups and individual animals have been observed along the Colville River.

Dall's Sheep inhabit the NPR-A in small numbers within the extreme southern foothills region. It is estimated that the population is approximately 100 animals (see Wildlife II Map).

Grizzly bears are found throughout the NPR-A, but are generally associated with the river valleys and foothills of the Brooks Range where they forage during spring, summer, and fall. There is a higher concentration of bears located in the Utukok uplands where many make their winter dens. The grizzly bear population has not been determined, although several studies estimated the density at 600-700 bears.

Wolves are found throughout the Arctic Slope, with an estimated population of between 100 to 300 animals. The population is the highest in the foothills and mountains, and lowest along the Arctic Coastal Plain.

Wolverines are found throughout the area, but are more common along the river valleys and foothills of the Brooks Range. Wolverines within the area are considered low in numbers, except along the Colville River and its major tributaries.

Barrow
Wainwright
Point Lay
Atqasuk
Nuiqsut
Deadhorse
Prudhoe Bay
Teshekpuk Lake
National Petroleum Reserve-Alaska
Colville River
DALTON HIGHWAY and Trans-Alaska Pipeline System (TAPS)
Alaska Maritime National Wildlife Refuge
Point Hope
LISBURNE PENINSULA
DE LONG MOUNTAINS
BROOKS RANGE
Red Dog Mine
Noatak National Preserve
Kivalina
Noatak
Cape Krusenstern National Monument
BAIRD MOUNTAINS
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve
HARRISON BAY

National Petroleum Reserve- Alaska
Wildlife I

- Western Arctic Caribou Herd
- Teshekpuk Lake Caribou Herd
- Caribou Calving "Prime Areas"
- Movement (General)
- National Petroleum Reserve-Alaska Boundary

0 20 40 60 MILES
0 20 40 60 KILOMETERS
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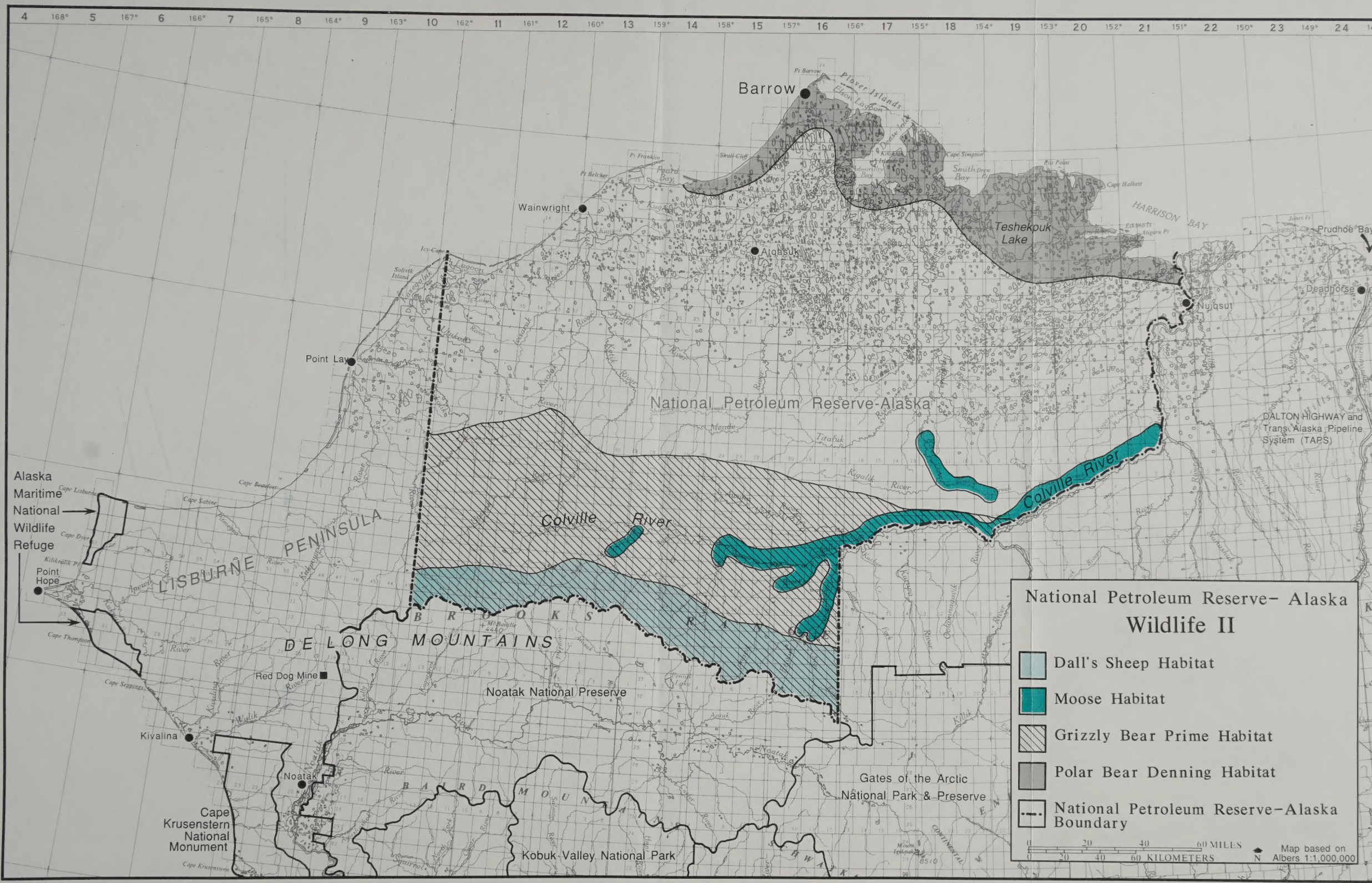
Map based on Albers 1:1,000,000


Barrow
Pt Barrow
Plover Islands
Elson Lagoon
Pt Franklin
Skull Cliff
Pt Belcher
Peard Bay
Wainwright
Cape Simpson
Smith Bay
Pitt Point
Cape Halkett
HARRISON BAY
Teshekpuk Lake
Prudhoe Bay
Deadhorse
Nuiqsut
Atqasuk
Icy Cape
Solivik Island
Lagoon
Point Lay
Ulukhaktok
River
National Petroleum Reserve-Alaska
DALTON HIGHWAY and Trans Alaska Pipeline System (TAPS)
Colville River
Alaska Maritime National Wildlife Refuge
Point Hope
LISBURNE PENINSULA
Cape Lisburne
Cape Beaufort
Cape Sabine
Cape Dyer
Cape Thompson
Cape Seppings
Colville River
BROOKS RANGE
DE LONG MOUNTAINS
Mt Baird 4460
Red Dog Mine
Noatak National Preserve
Kivalina
Noatak
BARD MOUNTAINS
Gates of the Arctic National Park & Preserve
Cape Krusenstern National Monument
Kobuk Valley National Park
Mount Igikpak 8510
CONTINENTAL DIVIDE
SCHWATKA MOUNTAINS
National Petroleum Reserve- Alaska
Wildlife II
Dall's Sheep Habitat
Moose Habitat
Grizzly Bear Prime Habitat
Polar Bear Denning Habitat
National Petroleum Reserve-Alaska Boundary
0 20 40 60 MILES
0 20 40 60 KILOMETERS
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Map based on Albers 1:1,000,000

Arctic Fox are the most economically important furbearer on the North Slope. It is found throughout the NPR-A, but most commonly along the coastal plain. The estimated arctic fox population within the NPR-A is between 500-600 animals.

Six raptor species regularly inhabit the NPR-A: peregrine falcon (already noted anong threatened and endangered species), gyrfalcon, rough-legged hawk, golden eagle, snowy owl, and the short-eared owl. The gyrfalcon and snowy owl are resident species, the others are migrants (see Wildlife III Map).

Gyrfalcons are common throughout the southern half of the area, they do not extend nesting activity as far north as do rough-legged hawks or peregrine falcons. Data from surveys over the last several years indicates a relatively stable gyrfalcon population, although highs and lows vary from year to year. In 1987, there were 24 pairs of gyrfalcons observed nesting along the Colville River and its tributaries.

Rough-legged hawks are the most abundant raptor, with several hundred pairs observed annually along the Colville River and its tributaries. Rough-legged hawk populations can fluctuate dramatically from year to year as the availability of prey species varies. In 1987, there were 112 pairs of rough-legged hawks observed nesting along the Colville River and its tributaries.

Golden eagles are widely dispersed in sparse numbers, but are more commonly found in the southern half of the region. Within the foothill region of the Brooks Range, golden eagles nest along the upper reaches of many tributaries to the Colville River. In 1988 there were 3 pairs of eagles observed nesting along tributaries to the Colville River.

Snowy and short-eared owls are the most common owls on the Arctic Slope. The great horned, great gray, and boreal owls are occasional visitors, mainly in the mountains of the Brooks Range. The snowy and short-eared owl populations fluctuate markedly in relationship to population cycles of lemmings, their main prey. The snowy owl is the only raptor known to be harvested for food, although this harvest is believed to be insignificant to the total population.

Waterfowl

Many species of ducks, geese and shorebirds inhabit NPR-A during the spring, summer and fall months. The general nesting habitat for waterfowl consists of small potholes, lakeshores, and stream banks, although Canada geese have been documented using cliffs along the Colville River for nesting (see Wildlife III Map). Pintails and oldsquaws are the two most common nesting ducks on the north slope. The density of waterfowl within the NPR-A has not been determined, but studies around Prudhoe Bay, sixty miles to the east, in similar habitat, indicate an average of 3.6 pairs of nesting ducks per square mile.

Almost 60,000 black brant, Canada, white-fronted and snow geese use the area around Teshekpuk Lake. Up to 23 percent of the world's pacific black brant molt to the north and east of Teshekpuk Lake. In addition to providing habitat for molting geese, the coastal wetlands provide habitat during fall staging not only of black brant but Canada geese, ducks, swans, and shorebirds.

Fisheries

The fisheries of the NPR-A provide extensive spawning, rearing, and overwintering areas crucial to resident and anadromous species. Overwintering habitat requires waters deep enough to avoid freezing solid in the winter and still have enough dissolved oxygen for fish survival. In flowing water of a stream or river, dissolved oxygen is usually not a problem. Depths greater than 7-10 feet (depending on water velocity) are considered sufficient to support overwintering fish. In standing waters of a lake or pond, water movement is less, the depth of ice is greater, and dissolved oxygen is reduced as the winter progresses. A lake depth of 18 feet is considered the minimum that can support overwintering fish and lakes with this depth are generally found in the deep lake zone (see Fisheries Map). Therefore, a lake large in surface area may be devoid of fish, or only support a small population, if sufficient water depth is absent or present in only a small portion of the lake.

Based on species availability and human use, priority species include arctic char, grayling, whitefish (includes cisco), and salmon. Other game species, are either not present in significant numbers or are generally not sought by fishermen.

Arctic char are widely distributed in rivers and streams across the north slope. The anadromous (migrates to marine environments) and freshwater resident (no migration) forms of the species are present.

Barrow
Wainwright
Point Lay
Point Hope
Icy Cape
Solivik Island
Peard Bay
Pt Franklin
Pt Belcher
Skull Cliff
Cape Simpson
South Drew Bay
Pitt Point
Cape Halkett
HARRISON BAY
Teshekpuk Lake
Atqasuk
Prudhoe Bay
Deadhorse
Nuiqsut
James Is
Eskimo Pt
Angaru Pt
National Petroleum Reserve-Alaska
DALTON HIGHWAY and Trans Alaska Pipeline System (TAPS)
Colville River
Alaska Maritime National Wildlife Refuge
LISBURNE PENINSULA
Cape Lisburne
Cape Sabine
Cape Beaufort
Cape Dyer
Cape Thompson
Cape Seppings
Cape Krusenstern
BROOKS RANGE
DE LONG MOUNTAINS
BARD MOUNTAINS
Mt Baird 4440
Red Dog Mine
Noatak National Preserve
Kivalina
Noatak
Cape Krusenstern National Monument
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve
Meade
Titaluk
Kogaluk River
Utukok
Kukpowruk
Kukpuk
Kilikpilik
Wulik
Kivalina
Noatak
Kelly
Redstone
Killik
Etivluk
Anaktuvuk
Chandler
Colville
Itkillik
Alatna
Kuna
Kurupa
Ipewik
Kukpuk
Kukpowruk
Utukok
Kokolik
Kasegaluk Lagoon
Elson Lagoon
Dease Inlet
Admiralty Bay
Kikiktat Is
Franklin Is
Barrow Spit
Pt Barrow
Wainwright Inlet
Kuk River
Ikpikpuk River
Meade River
Titaluk River
Kogaluk River
Avalik River
Kukpowruk River
Utukok River
Kokolik River
Kukpuk River
Kilikpilik River
Wulik River
Kivalina River
Noatak River
Kelly River
Redstone River
Killik River
Etivluk River
Anaktuvuk River
Chandler River
Colville River
Itkillik River
Alatna River
Kuna River
Kurupa River
Ipewik River
Kasegaluk Lagoon
Elson Lagoon
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Franklin Is
Barrow Spit
Wainwright Inlet
Kuk River
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Titaluk River
Kogaluk River
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Kukpowruk River
Utukok River
Kokolik River
Kukpuk River
Kilikpilik River
Wulik River
Kivalina River
Noatak River
Kelly River
Redstone River
Killik River
Etivluk River
Anaktuvuk River
Chandler River
Colville River
Itkillik River
Alatna River
Kuna River
Kurupa River
Ipewik River

National Petroleum Reserve- Alaska

Wildlife III

- Peregrine Falcon "Prime Nesting Habitat"
- Prime Waterfowl Habitat
- Major Waterfowl Feeding/Molting/ High Sensitivity Areas
- National Petroleum Reserve-Alaska Boundary

0 20 40 60 MILES
0 20 40 60 KILOMETERS
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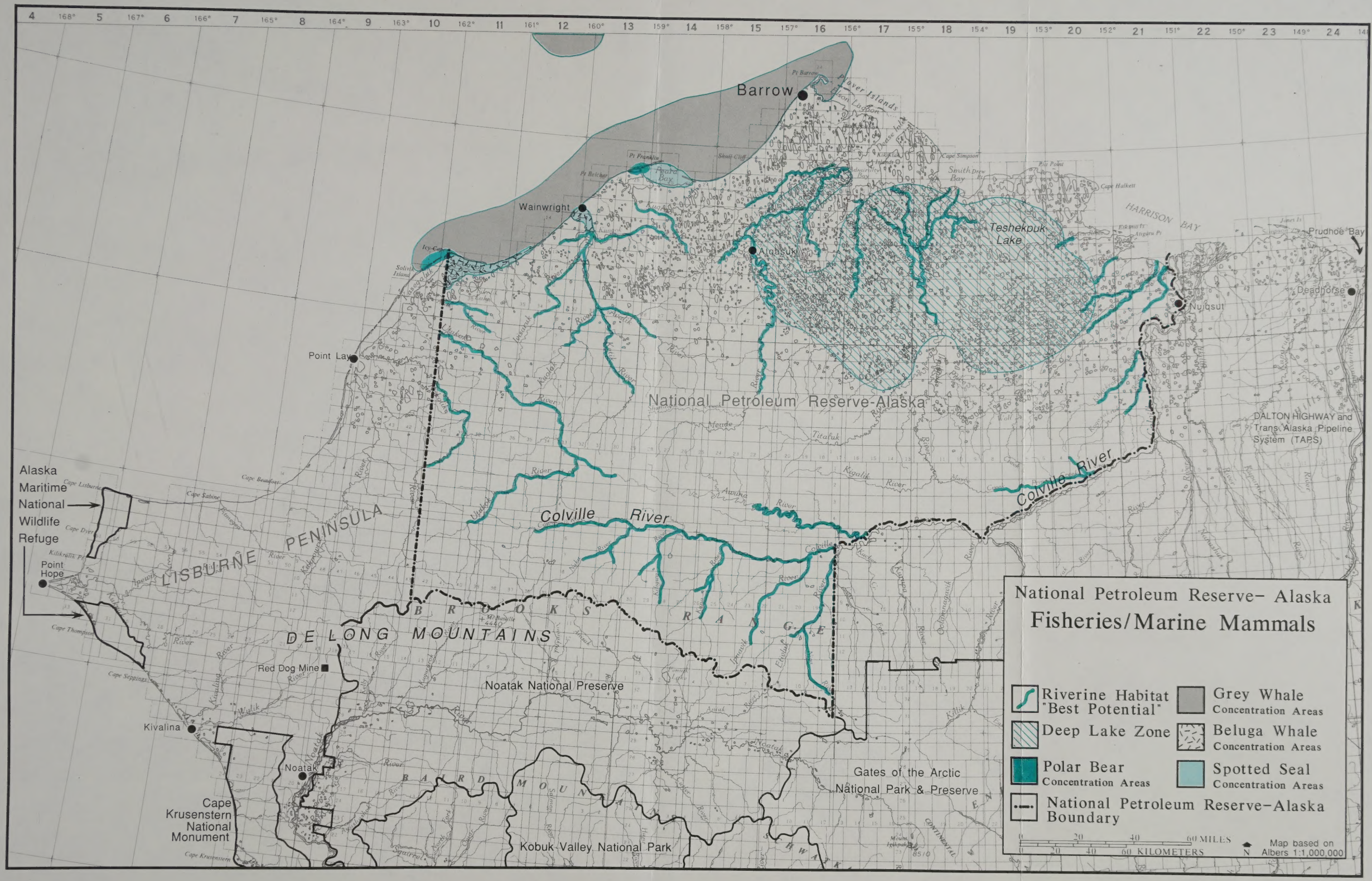
Map based on Albers 1:1,000,000


Barrow
Wainwright
Point Lay
Point Hope
Kivalina
Noatak
Red Dog Mine
Alqasuk
Teshekpuk Lake
Prudhoe Bay
Deadhorse
Nuiqsut
National Petroleum Reserve-Alaska
Noatak National Preserve
Gates of the Arctic National Park & Preserve
Kobuk Valley National Park
Cape Krusenstern National Monument
Alaska Maritime National Wildlife Refuge
LISBURNE PENINSULA
DE LONG MOUNTAINS
BROOKS RANGE
BAIRD MOUNTAINS
HARRISON BAY
Colville River
DALTON HIGHWAY and Trans Alaska Pipeline System (TAPS)
National Petroleum Reserve– Alaska
Fisheries/Marine Mammals
Riverine Habitat "Best Potential"
Deep Lake Zone
Polar Bear Concentration Areas
National Petroleum Reserve–Alaska Boundary
Grey Whale Concentration Areas
Beluga Whale Concentration Areas
Spotted Seal Concentration Areas
0 20 40 60 MILES
0 20 40 60 KILOMETERS
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Map based on Albers 1:1,000,000

Arctic grayling are generally present in all clear water drainages north of the Brooks Range. They inhabit both rivers and lakes. In Arctic waters grayling are slow growing .

Whitefish, including arctic cisco, least cisco, broad whitefish, humpback whitefish and round whitefish, are believed to be the most abundant fish inhabiting the north slope. They are also the most important in terms of demand by subsistence and commercial fishermen in the Arctic. The life histories of the five whitefish species vary, but there are some generalities. Most prefer stream or riverine habitat, but the least cisco is also common in lakes.

Salmon, including pink and chum salmon are found in the western Beaufort but their occurrence is thought to be occasional and their abundance low.

Marine Mammals

Although not classically considered a resource of the NPR-A, the marine mammals play a significant role in the biological as well as subsistence regimes of this area. Major species include the ringed seal, bearded seal, spotted seal, walrus, polar bear, and bowhead, grey and beluga whales (see Marine Mammals Map).

Pinnipeds (seals) are abundant throughout the Beaufort and Chukchi seas Ringed and Bearded Seals use moving and shorefast ice while the spotted seals use ice, beaches, barrier islands and remote sandbars on river deltas as hauling out areas. Generally pupping, breeding, and molting occur on ice areas. Walruses migrate past the NPR-A and are in the highest abundance along the pack-ice front.

Polar bears can be found on the drifting pack ice, on the shorefast or polar pack ice and seasonally inhabit onshore areas, generally within 20 miles of the Arctic Ocean. Their location is related to the availability and abundance of subadult seals. Pregnant and lactating females and newborn cubs are the only polar bears that occupy dens on offshore islands and certain portions of the mainland for extended periods of time.

Whales are an offshore species that are carefully monitored to ensure protection. The beluga whales are relatively common with the grey and bowhead whales being endangered and threatened species.

Scenic Quality Evaluation

NPR-A has been divided into sixteen scenic quality rating units in a 1977-78 study (see Scenic Quality Evaluation Map). The basic elements include landform, vegetation, water, color distinctiveness, and cultural modification. Landform, vegetation, water, and color are self-explanatory. Distinctiveness is used to measure a scenic resource which is very rare or unique within a region or may be somewhat more common, but, because of its distinguishing characteristics, is unusually memorable. Cultural modifications are defined as any man-caused change in the land or water form or vegetation or the addition of a structure which creates a visual contrast in the basis elements (form, line, color, texture) of the natural landscape.

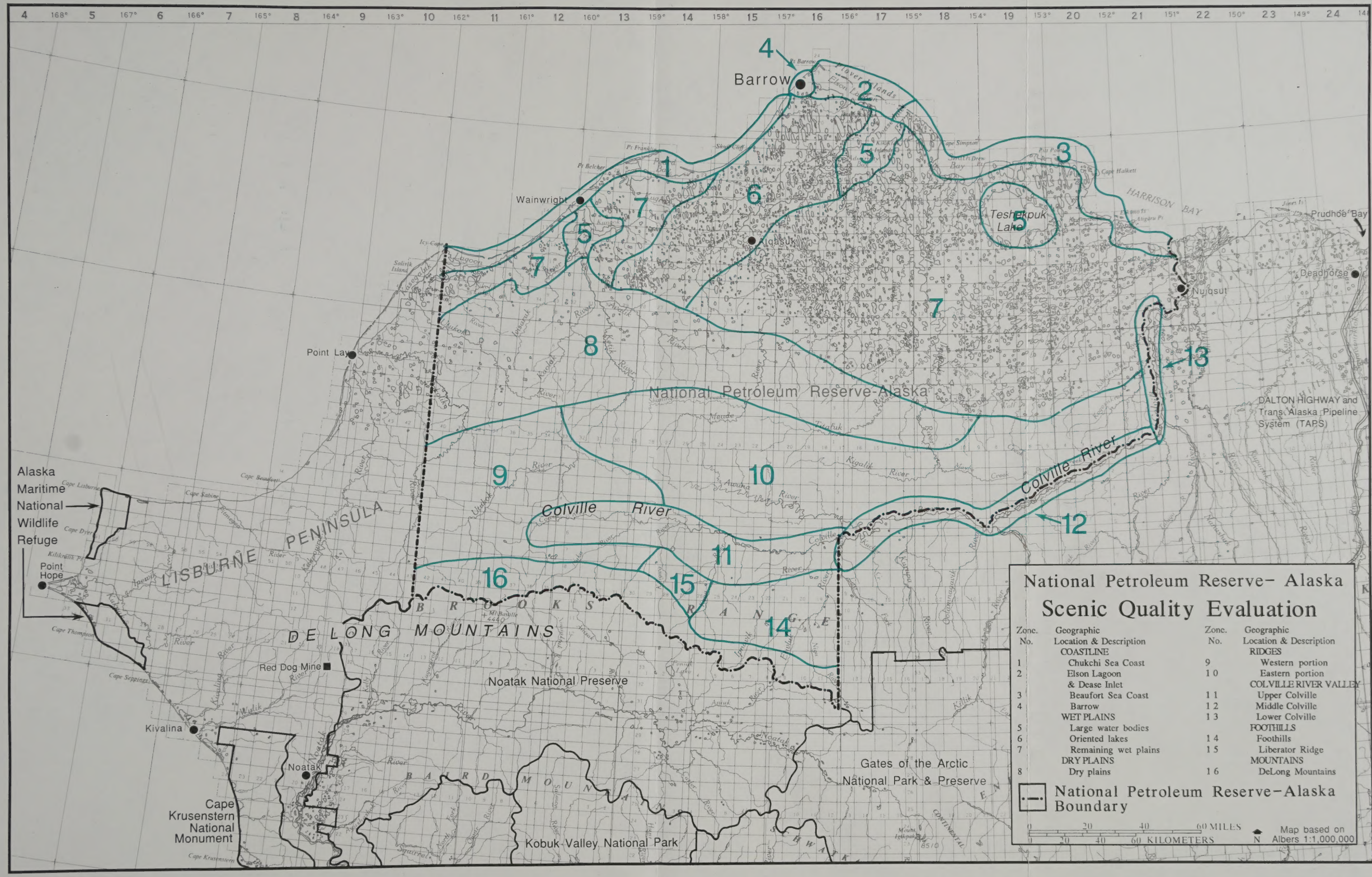
Paleontology

Since the mid-1980s the NPR-A has become increasingly well known for its internationally significant dinosaur remains located at Ocean Point along the Colville River. These are the most northern fossil dinosaur remains in the world. As of 1990, five species of dinosaurs have been identified with their age of 65-70 million years old placing them at the end of the Age of Dinosaurs (end of the Mesozoic Period). As such, they are of particular interest to scientists studying questions about the mysterious extinction of dinosaurs 65 million years ago. Further, located north of the Arctic Circle, their presence raises questions of how they survived during winter months when available estimated vegetative biomass was insufficient for their survival. NPR-A contains nearly 600 other paleontological sites are, including a large number of ice-age Pleistocene fossils. All of these have a great potential for shedding light on past global climate changes as well as evolving biological diversity.

Special Areas

Two special areas were identified in the National Petroleum Reserves Production Act of 1976 and are important because of their specific biological resource values. These areas include priority plant communities where wildlife species depend on vegetation, either directly or indirectly, for food and/or cover (see Special Areas Map). The legislative designated areas are:

Utukok Uplands Special Area. This area provides crucial habitat for the Western Arctic Caribou herd which is dependent on its vegetation. A high concentration of grizzly bears in the area depend on a prey base supported by the Moist Tundra and Alpine Tundra communities dominating the area.



National Petroleum Reserve– Alaska

Scenic Quality Evaluation

Zone No.	Geographic Location & Description	Zone No.	Geographic Location & Description
	COASTLINE		RIDGES
1	Chukchi Sea Coast	9	Western portion
2	Elson Lagoon & Dease Inlet	10	Eastern portion
			COLVILLE RIVER VALLEY
3	Beaufort Sea Coast	11	Upper Colville
4	Barrow	12	Middle Colville
	WET PLAINS	13	Lower Colville
5	Large water bodies		FOOTHILLS
6	Oriented lakes	14	Foothills
7	Remaining wet plains	15	Liberator Ridge
	DRY PLAINS		MOUNTAINS
8	Dry plains	16	DeLong Mountains

National Petroleum Reserve–Alaska Boundary

0 20 40 60 MILES
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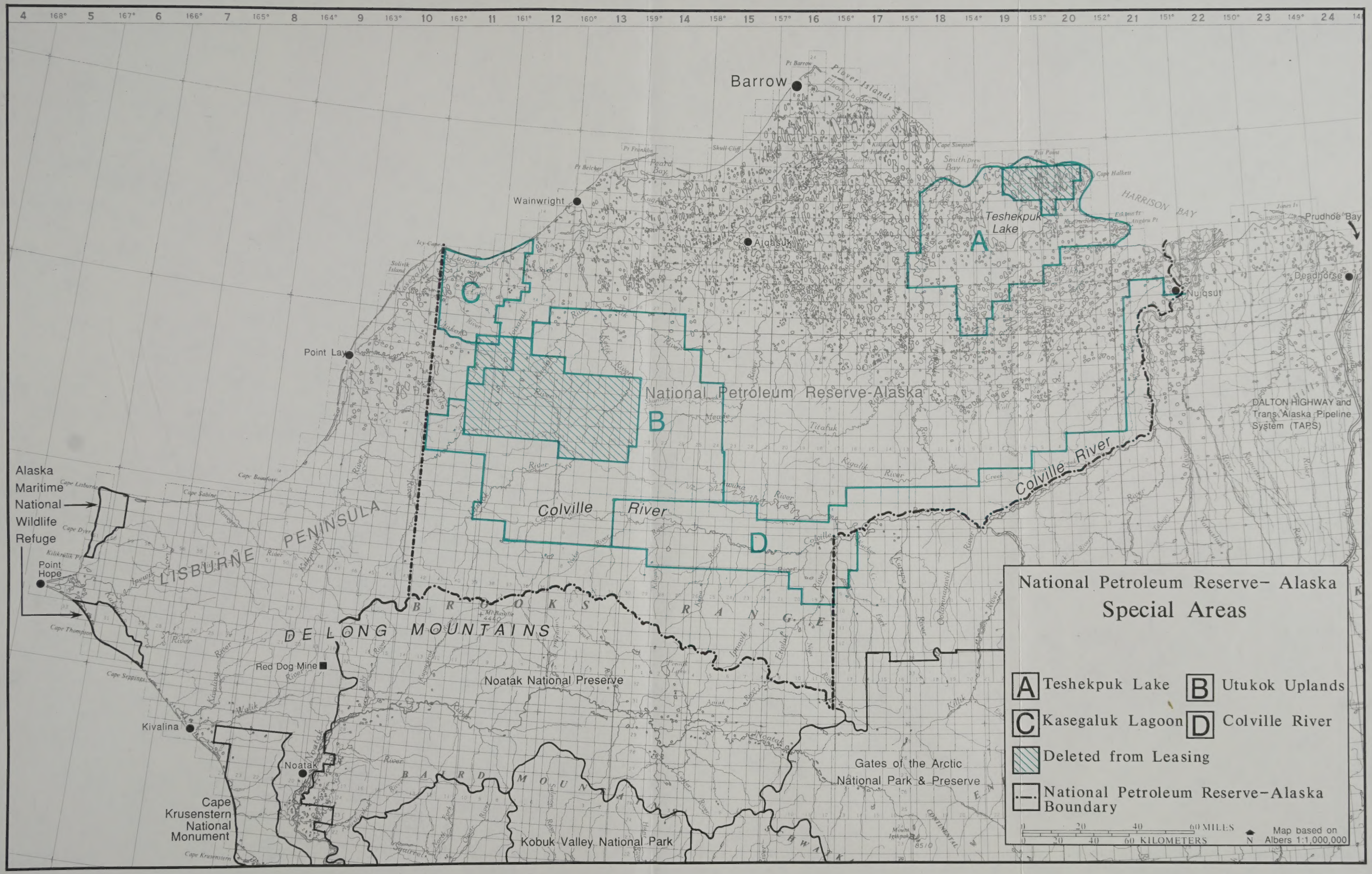
Map based on Albers 1:1,000,000


Barrow
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Point Lay
Point Hope
Kivalina
Noatak
Red Dog Mine
Cape Krusenstern National Monument
Alaska Maritime National Wildlife Refuge
Teshekpuk Lake
A
B
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D
National Petroleum Reserve-Alaska
Colville River
Noatak National Preserve
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve
Prudhoe Bay
Deadhorse
Nuiqsut
DALTON HIGHWAY and Trans Alaska Pipeline System (TAPS)
L'ISBURNE PENINSULA
DE LONG MOUNTAINS
BROOKS RANGE
BARD MOUNTAINS
HARRISON BAY
Player Islands
Peard Bay
Smith Bay
Cape Simpson
Cape Halkett
Pitt Point
Skull Cliff
Icy Cape
Solivik Island
Kasegaluk Lagoon
Cape Lisburne
Cape Beaufort
Cape Sabine
Cape Dyer
Cape Thompson
Cape Seppings
Titaluk
Meade
Ikpikpuk
Kigalik
Chukchi Sea
National Petroleum Reserve- Alaska
Special Areas
A Teshekpuk Lake
B Utukok Uplands
C Kasegaluk Lagoon
D Colville River
Deleted from Leasing
National Petroleum Reserve-Alaska Boundary
0 20 40 60 MILES
0 20 40 60 KILOMETERS
N
Map based on Albers 1:1,000,000

Teshekpuk Lake Special Area. This area is crucial habitat for extremely high concentrations of nesting, molting and premigration staging waterfowl. The area also supports a resident caribou herd dependent on the Wet Tundra community of the area.

The Secretary of the Interior later identifies the **Colville River Special Area** under authority granted by the NPRPA. The area is known for raptors which depend on a prey base supported by the High Brush community along the river. Moose, caribou, grizzly bears, waterfowl and shorebirds are all attracted to the area because of the relatively rich vegetative community and the fauna it supports.

A fourth area, **Kasegaluk Lagoon** which is located at the northwestern corner of the NPR-A, represents the best example of a barrier island lagoon environment. There are large concentrations of waterfowl which stage and feed prior to migrating south and numerous marine mammals, such as the beluga whale, in the area. This area was found to have important biological resources in BLM's 1983 Final Oil and Gas Environmental Impact Statement.

PEOPLE in the NPR-A

People

Native peoples have occupied the north slope, including portions of the NPR-A, for at least 8,000 years. This remote, treeless, mostly frozen land, comprised of highly fragile terrain and delicate ecological balances, is a place where human survival was possible only by the development of a highly sophisticated culture. Consequently, respect for the environment and its resources became the centerpiece of this culture.

Since Eskimos came to the north slope, they have sustained themselves by harvesting the wild resources of the land and sea, following a lifeway which entails the most direct interactions between people and their environment. This intimate relationship to the land has exerted a powerful shaping effect on Inupiat culture which has, by necessity, adapted itself to the encompassing environment and its imperatives.

The Inupiat of the North Slope did not come into significant contact with Euro-Americans until the early 19th century. Captain F. W. Beechey of *H. M. S. Blossom* explored the northern coast in 1826 naming Point Barrow and Wainwright, sites in what was to become Alaska. By the end of the 1850s, whaling ships were regular visitors to the northern coastal waters, bringing

with them firearms, alcohol, and epidemic diseases that changed Native life forever.

As foreign whaling continued into the late 19th century, Inupiat were hired as crew members and guides, beginning the mixing of western and subsistence economies that continues today. Continued contact with foreign whalers, trappers, missionaries, and government officials through the early 20th century began changing the Inupiat in other ways. Historic patterns of migratory hunting and living in temporary seasonal camps to harvest local resources were slowly modified as the eskimos took up more permanent residences.

Seasonal mobility was increasingly traded for year-round settlement near newly established trading posts and missions such as Wainwright and Barrow. By the 1950s most of the inland Inupiat had moved to coastal settlements, Anaktuvuk Pass, or south of the Brooks Range. They still use the NPR-A for subsistence.

Social relations facilitate the use of natural resources from three major ecological zones: sea ice, littoral, and inland terrestrial. The exploitative dichotomy between inland- and marine-oriented Inupiat groups permitted maximum utilization of resources from the sea and coast south to the Brooks Range. As a result, anthropologists have distinguished two distinct ecological adaptations, inland or Nunamiut, and coastal or Tareumiut, but the two are culturally one group with functional differentiation based upon location and maximized utilization of the varied ecosystems.

Table 2 shows the growth in population of villages in the NPR-A to 1989.

TABLE 2
SELECTED NPR-A VILLAGE POPULATIONS

Village	1929	1950	1989
		Population	
Atqasuk	**	50	219
Barrow	330	2,002	3,223
Nuiqsut	**	**	314
Wainwright	197	300	502

**Atqasuk did not exist as a village in 1929. Nuiqsut did not exist as a village until after 1950.

Cultural and Historic Resources

Archaeological sites, historic sites and traditional land use areas are important to the Native residents as a tie to their cultural past and to other Alaskans, and to the nation as a whole as a window on past cultures of the Arctic and North America (see Cultural and Historic Resources Map). Limited archaeological surveys in the foothills of the Brooks Range and along the Arctic Ocean coastline have already found more than 1,400 archeological sites. These include six archaeloogical districts and eight individual sites listed on the National Register of Historic Places. Further sites may be expected on the high ground, near lake shores, and along rivers and creeks. Small hunting and fishing camps and larger, seasonal, village sites are still being found.

Socioeconomics

The NPR-A is located within the North Slope Borough (NSB), which encompasses 88,281 square miles and virtually all the land north of the Brooks Range. The North Slope has a fairly homogeneous population: 72 percent are Inupiat. All North Slope communities are tied to the larger world via telephone, cable television, and regularly scheduled commercial air transportation. The tax base of the NSB consists primarily of the enormously high value petroleum-industry-related property in the Prudhoe Bay area. The increased tax base has allowed the NSB to dramatically change the physical appearances of the communities. Blocks of modern houses, new schools, water-treatment plants, power plants, and community buildings stand out. In FY 1989 NSB's total revenue were estimated at $317 million. These revenues have funded greatly improved educational, health, and other government services as well as a substantial capital improvement program which has created a large number of construction jobs for permanent residents.

Total North Slope resident and commuter employment in 1989 was estimated at around 7,000, down from a peak of over 10,300 in 1983. Resident employment was about 2,500 with the remainder in commuter oil-related jobs.

Travel within NPR-A is accomplished by air, small boat, specialized ground vehicles and by foot; no through-travel roads exist. Landing strips are present at the smaller villages, and jet airports at Barrow and Deadhorse.

Government and Planning Efforts

The North Slope Borough was incorporated as a first-class borough on July 1, 1972, and assumed a variety of area-wide governmental powers, including mandatory powers of taxation, education, and planning, platting, and zoning. The NSB, as a home-rule borough, has all legislative powers not prohibited by state law or charter.

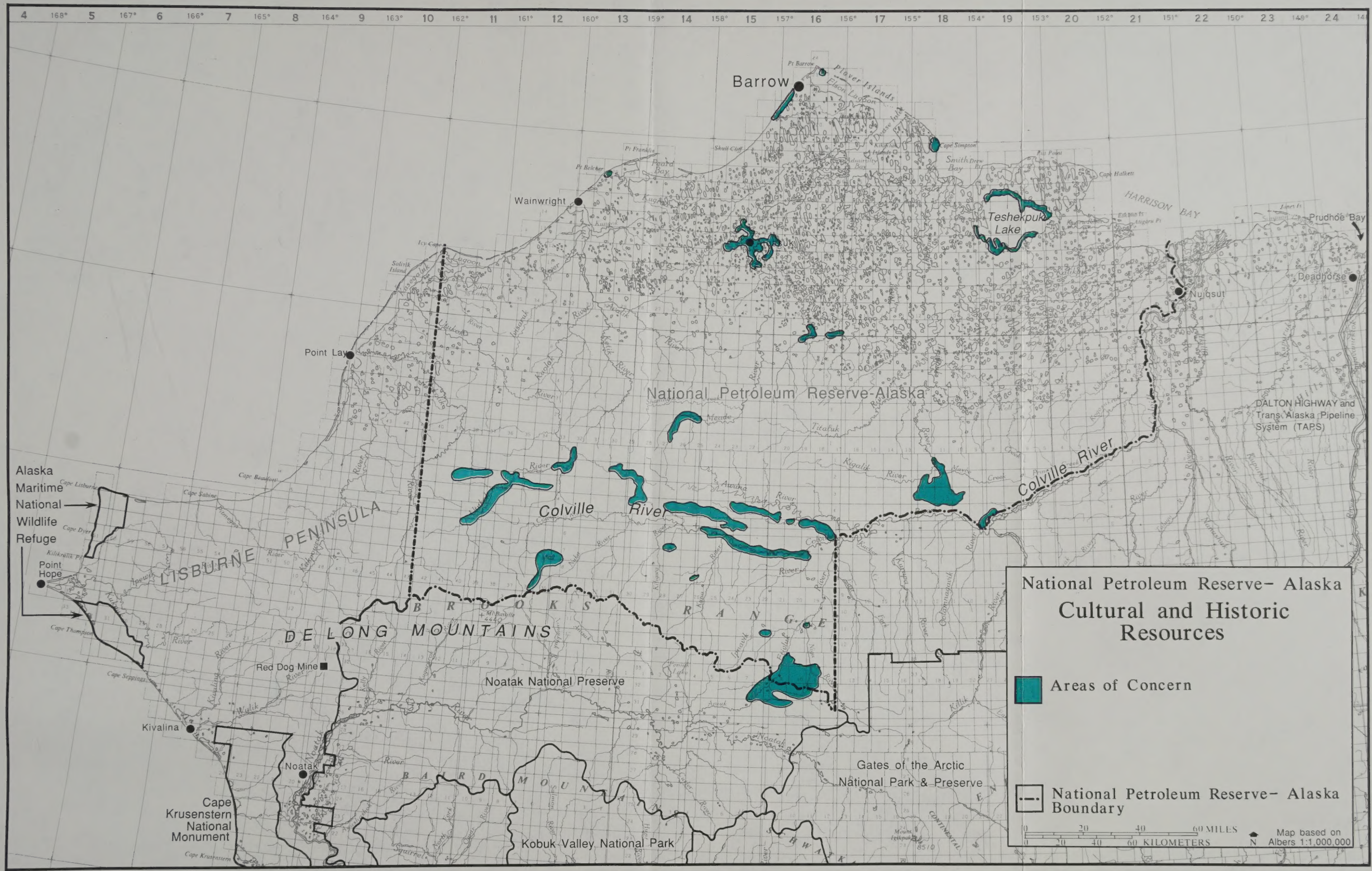
The NSB Comprehensive Plan was adopted in December 1988. The premise of the comprehensive plan was to protect and preserve the land and water habitat essential to subsistence living and the Inupiat lifeway.

A minerals inventory was initiated in 1990 by the BLM, the Bureau of Mines, the U.S. Geological Survey and with the assistance of the State of Alaska and is expected to be completed in 1994.

Several other studies suggest the course development may take in areas adjacent to NPR-A. These developments may influence the future of the reserve. The Minerals Management Service has completed EISs for oil and gas leasing in both the Chukchi and Beaufort seas. Exploratory drilling has taken place in both seas. Should fields in either be developed, onshore facilities may be necessary in NPR-A. Development of such fields, coupled with discoveries of oil in the Colville Delta, and continued development of the Kuparuk field just to its east may increase interest in oil and gas potential in the reserve, and may lead to the develop of an infrastructure and/or major oil and gas trunk lines from the Chukchi Sea across the NPR-A to the Trans Alaska Pipeline. Studies undertaken by Arctic Slope Regional Corporation in the late 1980s to develop its coal holdings directly west of NPR-A also suggest the long term potential for coal development in the reserve.

Land Status and Rights-of-Way

Land ownership other than BLM within the NPR-A is limited to Native holdings conveyed under the Alaska Native Claims Settlement Act (ANCSA) and the Native Allotment Act. Native holdings conveyed under ANCSA generally surround each of the four villages within NPR-A, and are reasonably compact and contiguous. Private ownership of land within NPR-A is extremely limited because of withdrawal by Executive Order in 1923 and the Naval Petroleum Reserves Production Act of 1976. The withdrawal and act have precluded most applicants for Native Allotments, and virtually any long term use or development not related to oil and gas resources. There are, however, 280 pending applications for Native Allotment parcels within the NPR-A (see Land Status Map).


Barrow
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Point Lay
Point Hope
Kivalina
Noatak
Red Dog Mine
Teshekpuk Lake
Prudhoe Bay
Deadhorse
Nuiqsut
National Petroleum Reserve-Alaska
DALTON HIGHWAY and Trans-Alaska Pipeline System (TAPS)
Colville River
Alaska Maritime National Wildlife Refuge
LISBURNE PENINSULA
DE LONG MOUNTAINS
BROOKS RANGE
BAIRD MOUNTAINS
Noatak National Preserve
Kobuk Valley National Park
Gates of the Arctic National Park & Preserve
Cape Krusenstern National Monument
HARRISON BAY
Peard Bay
Smith Bay
Elson Lagoon
Plover Islands
Icy Cape
Lagoon
Cape Halkett
Cape Simpson
Pt Barrow
Pt Franklin
Pt Belcher
Skull Cliff
Pitt Point
Cape Lisburne
Cape Sabine
Cape Beaufort
Cape Dyer
Cape Thompson
Cape Seppings
Kilikrelik Pt
Solivik Island
Meade
Titaluk
Awuna
Kigalik
Kuyuk
Ikpikpuk
Colville
Killik
Noatak
Kelly
Wulik
Kivalina
Ipewik
Kukpowruk
Kokolik
Utukok
Squirrel
Mt Baillie
4420
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National Petroleum Reserve- Alaska
Cultural and Historic Resources
Areas of Concern
National Petroleum Reserve- Alaska Boundary
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Map based on Albers 1:1,000,000

Barrow
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Point Lay
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Prudhoe Bay
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Kobuk Valley National Park
Gates of the Arctic National Park & Preserve

National Petroleum Reserve– Alaska
Land Status

- BLM Administered Public Land
- Native owned and Native owned surface/BLM subsurface
- National Petroleum Reserve–Alaska Boundary

0 20 40 60 MILES
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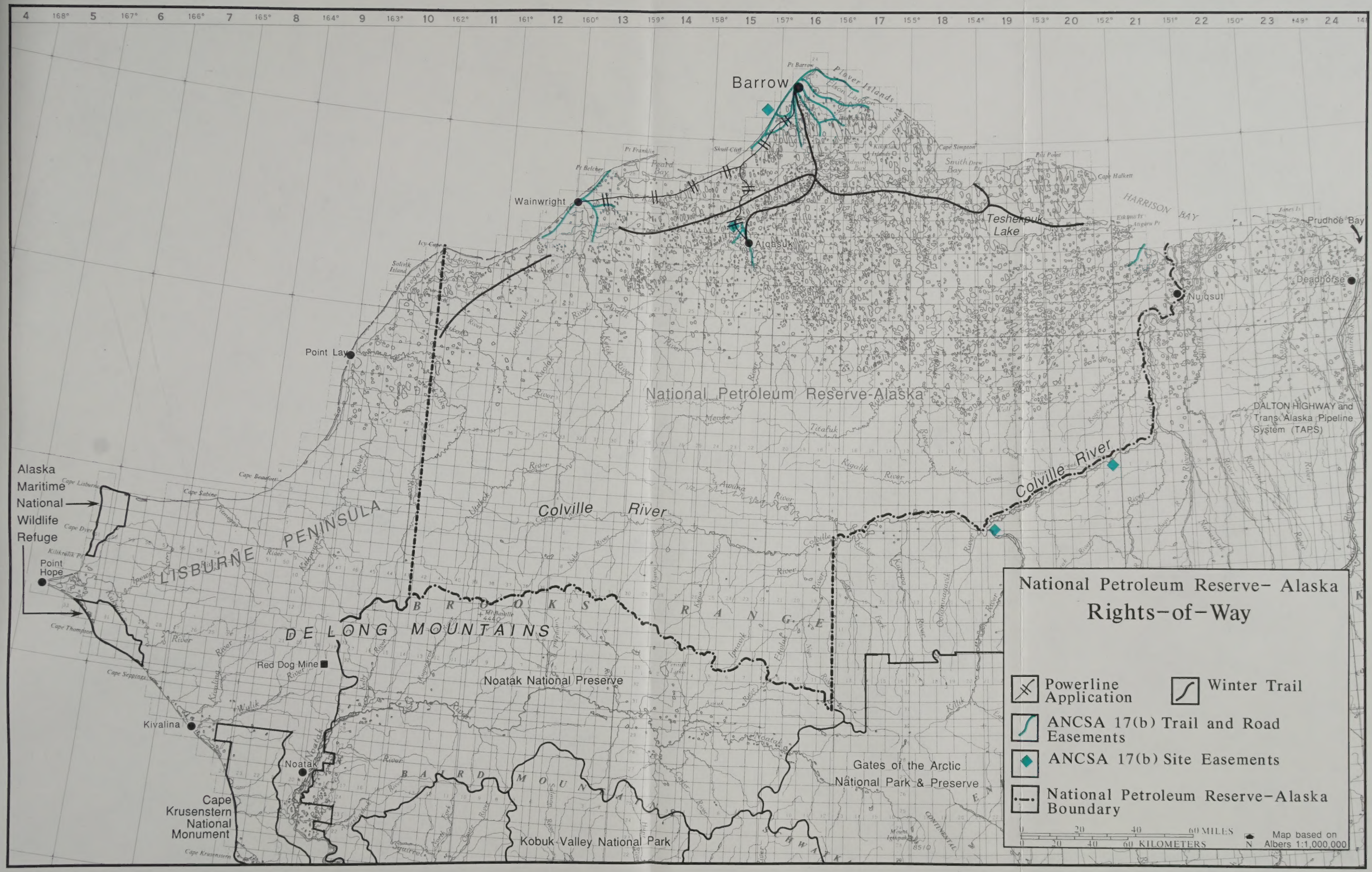
Map based on Albers 1:1,000,000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Cape Dyer
Cape Thompson
Cape Seppings
Mt Doonerak 8510
Mt Baird 4440
Colville River
Kigalik River
Meade
Titaluk
Awuna River
Ikpikpuk River
Itkillik River
Kuparuk River
Sagavanirktok River
Toolik Lake
Galbraith Lake
Imnaviat Creek
Ivotuk
Anaktuvuk River
Killik River
Noatak River
Wulik River
Kivalina River
Kobuk River
Squirrel River
Hunt Fork
Redstone River
Ambler River
Kelly River
Kugururok River
Utukok River
Kukpowruk River
Kokolik River
Ipewik
Kaolak River
Kasegaluk Lagoon
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Solivik Island
National Petroleum Reserve- Alaska
Rights-of-Way
Powerline Application
Winter Trail
ANCSA 17(b) Trail and Road Easements
ANCSA 17(b) Site Easements
National Petroleum Reserve-Alaska Boundary
0 20 40 60 MILES
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Map based on Albers 1:1,000,000

ANCSA only allowed the the conveyance of surface estate land in NPR-A. The Barrow Gasfields Transfer Act, however, resulted in 75,425 acres of gas estate being transferred. Table 3 summarizes land transfer and ownership acres.

TABLE 3
NATIONAL PETROLEUM RESERVE-ALASKA LAND STATUS*

Total Acreage NPR-A	23,031,932 acres
Surface Estate - BLM	22,347,489 acres
Subsurface Estate -BLM	22,789,638 acres
Interim Conveyed (IC)	
Surface Estate	683,670 acres
Subsurface Estate	75,425 acres
Native Allotment Applications	27,870 acres
North Slope Borough Subsurface	112,219 acres
UIC Sand and Gravel	90,692 acres
Arctic Slope Regional Corp. Surface/Subsurface	67,893 acres
Existing Oil and Gas Leases	228,898 acres**

* From Division of Conveyance, Alaska State Office
** Left after relinquishments, June 30,1990.

Conveyance of lands to the State of Alaska under the Statehood Act is not authorized because the lands have not been "vacant, unappropriated and unreserved" since the days of Statehood. Three active DEW line sites are authorized under rights-of-way. Another five are inactive and are scheduled for clean-up under the Defense Environmental Restoration Program.

There are 23 issued active rights-of-way (row) within the NPR-A, mostly in and around the villages. There are several pending row's, including a right of way for the construction of a power transmission line from Barrow to Atqasuk and Wainwright (see Rights-Of-Way Map).

Subsistence

The biotic resources, identified earlier in this *Reader*, are the key to a continued subsistence lifestyle, but the socio-cultural aspects of subsistence are also significant. Today, many Inupiat practice subsistence activities as a linkage both to their cultural past and present. Being a "subsistence user" is still the cultural ideal for many if not most Inupiat.

Recreation Resources

Despite the immense size of the area, recreational use of the region probably represents only about 1 percent of total statewide recreation (see Recreation Resources Map). Estimates of existing recreation-oriented use are shown in Table 4.

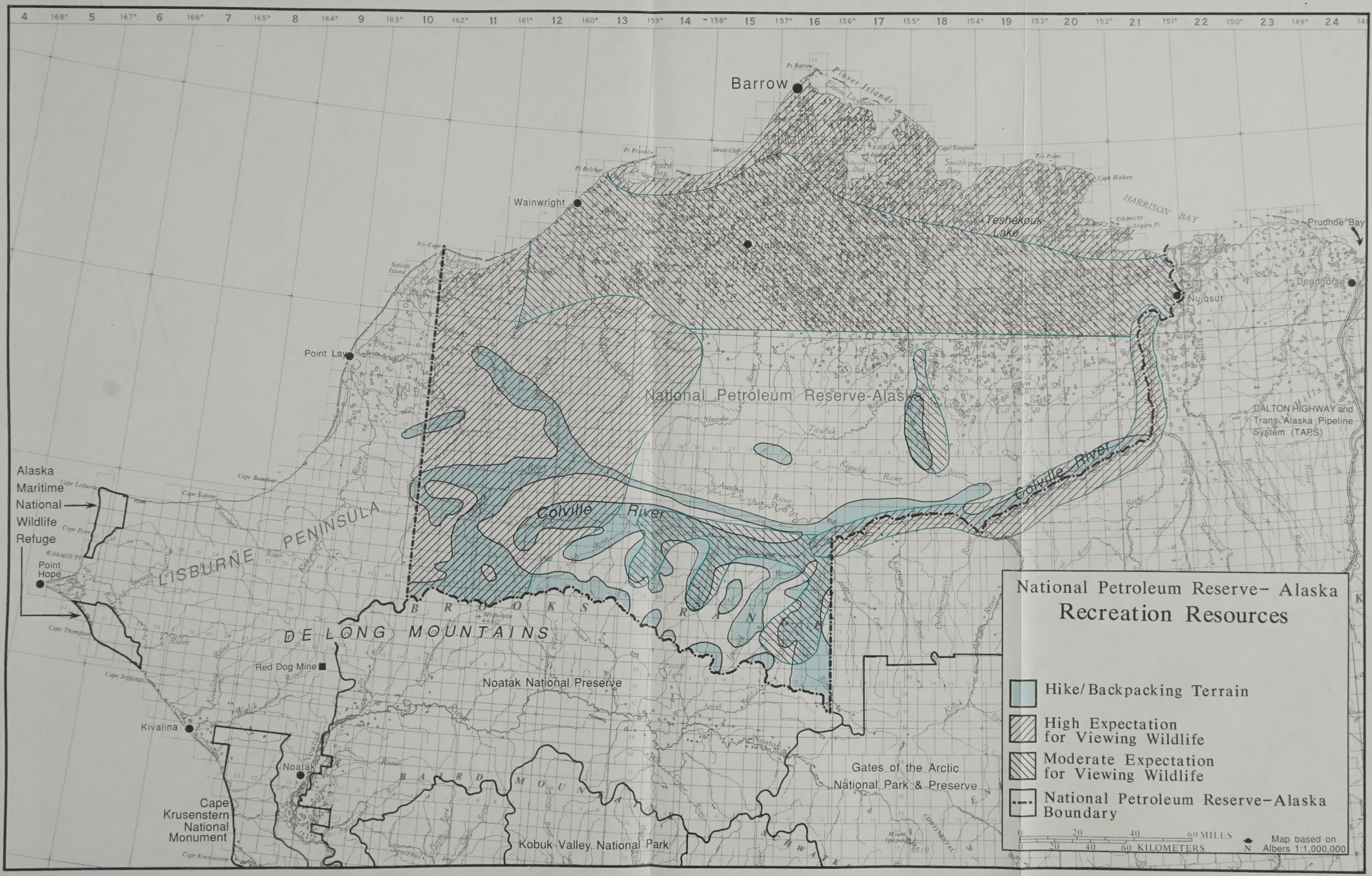
TABLE 4
ESTIMATES OF EXISTING RECREATION- 1989.

Activity	Estimated Annual Visits*1989
Backpacking	100
Floatboating	100
Sporthunting**	350
Winter Activities	100
Camping	100
Fishing	100
ORV Travel	100

*These figures represent the primary purpose of the visit. Most visitors actually engage in more than one activity during a typical visit, e.g., floatboaters may also engage in backpacking and sightseeing. Numbers rounded to nearest 100.

**Primarily for moose and caribou although grizzly bears and sheep are also hunted.

Most of the current recreation-oriented activity consists of organized tour groups; about 4,000 to 5,000 people visit Barrow annually. The number of additional people currently coming to the area to enjoy the sightseeing, hiking, camping, boating, and other recreation opportunities available in parts of the NPR-A is very small, probably less than 500 people annually.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Recreation Resources
Hike/Backpacking Terrain
High Expectation for Viewing Wildlife
Moderate Expectation for Viewing Wildlife
National Petroleum Reserve-Alaska Boundary
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0 20 40 60 KILOMETERS
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Map based on Albers 1:1,000,000

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